News about

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Hycar 1001, 1041, 1051. High acrylonitrile content, best oil and fuel resistance. Uses: High strength adhesives, fuel hose, oil well parts, fuel cell liners, and other uses requiring resistance to aromatic fuels, oils and solvents. Hycar 1051 provides superior processing characteristics.

Hycar 1411. Special finely divided powder type Hycar. Developed primarily for use in modification of phenolic and vinyl resins. May be used in applications where physical state is important.

Hycar 1002, 1042, 1052. Medium high acrylonitrile content. Uses: Shoe soles, kitchen mats, printing rolls, and other applications requiring good oil resistance. Hycar 1002 provides best water resistance of all nitrile rubbers. Hycar 1052 provides excellent processing characteristics. May be used for a vinyl resin modification and in blends with SBR for intermediate oil resistance.

Hycar 1312. Liquid Hycar polymer of the medium acrylonitrile type. A non-extractable, non-migrating, non-volatile plasticizer. Uses: As a plasticizer for nitrile compounds where improved flow and knitting are required. As a plasticizer in the preparation of plastisols. Can be cured to a medium or hard rubber state.

Hycar 1432. A low temperature polymerized, directly soluble polymer in crumb form. Adhesives and solvent solutions, where the crumb form and direct solubility are an excellent aid in handling and processing.

Hycar 1072. Excellent compatibility with vinyl and phenolic resins. Provides improved low temperature resistance to brittleness, good hot tear and outstanding abrasion resistance.

Hycar 1043, 1053. Medium acrylonitrile content for applications requiring improved low temperature properties. Hycar 1053 provides excellent extrusions and improved processing.

Hycar 1014. Low acrylonitrile content Hycar for special military requirements. Excellent low temperature flexibility is obtained at a slight sacrifice in oil resistance.

Hycar 4021 (PA-21). Polyacrylic acid ester copolymer. Developed for service requiring outstanding resistance to high temperature oil and air service. Uses: Air and hot oil applications at temperatures above 300°F. Ozone, light and flex resistant applications.

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Good-rite Vultrol. The modern retarder for SBR and crude rubber stocks. Safe processing with no sacrifice of rate of cure.

• For further information, write Dept. CA-10, B.F.Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

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COVERING THE MANUFACTURE OF RUBBER AND RUBBERLIKE PLASTICS PRODUCTS

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Highlights Sidelights *of the News . . .*

November, 1959

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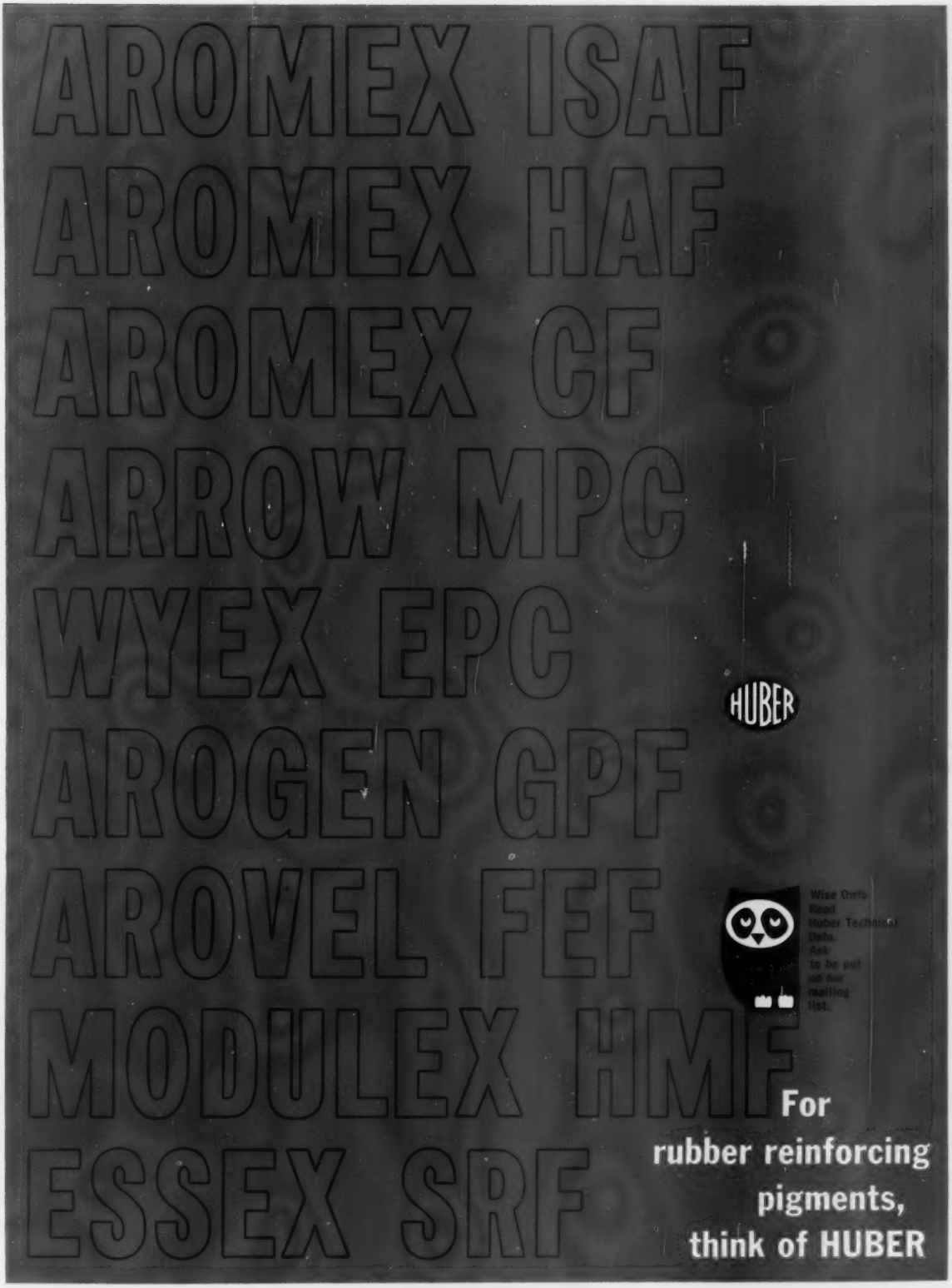

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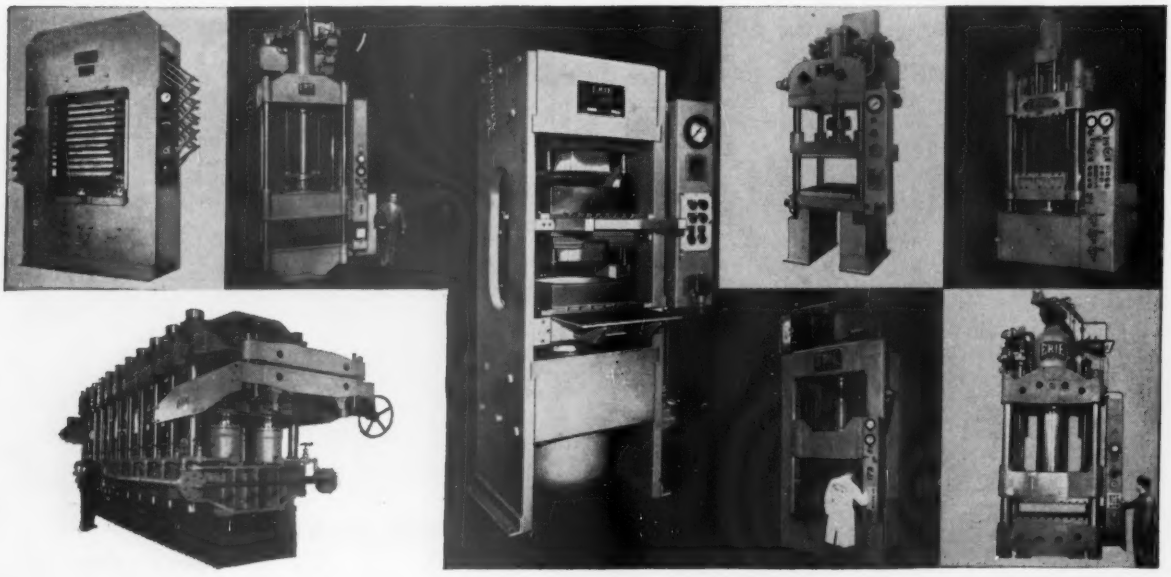

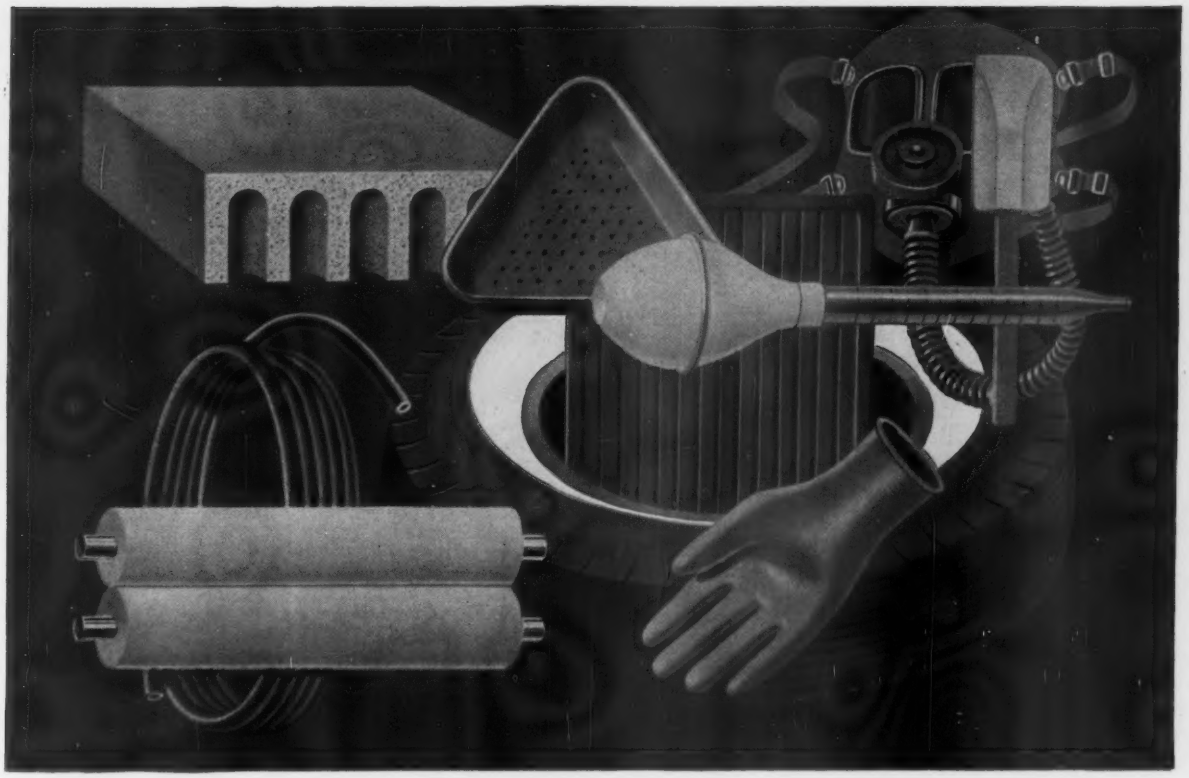

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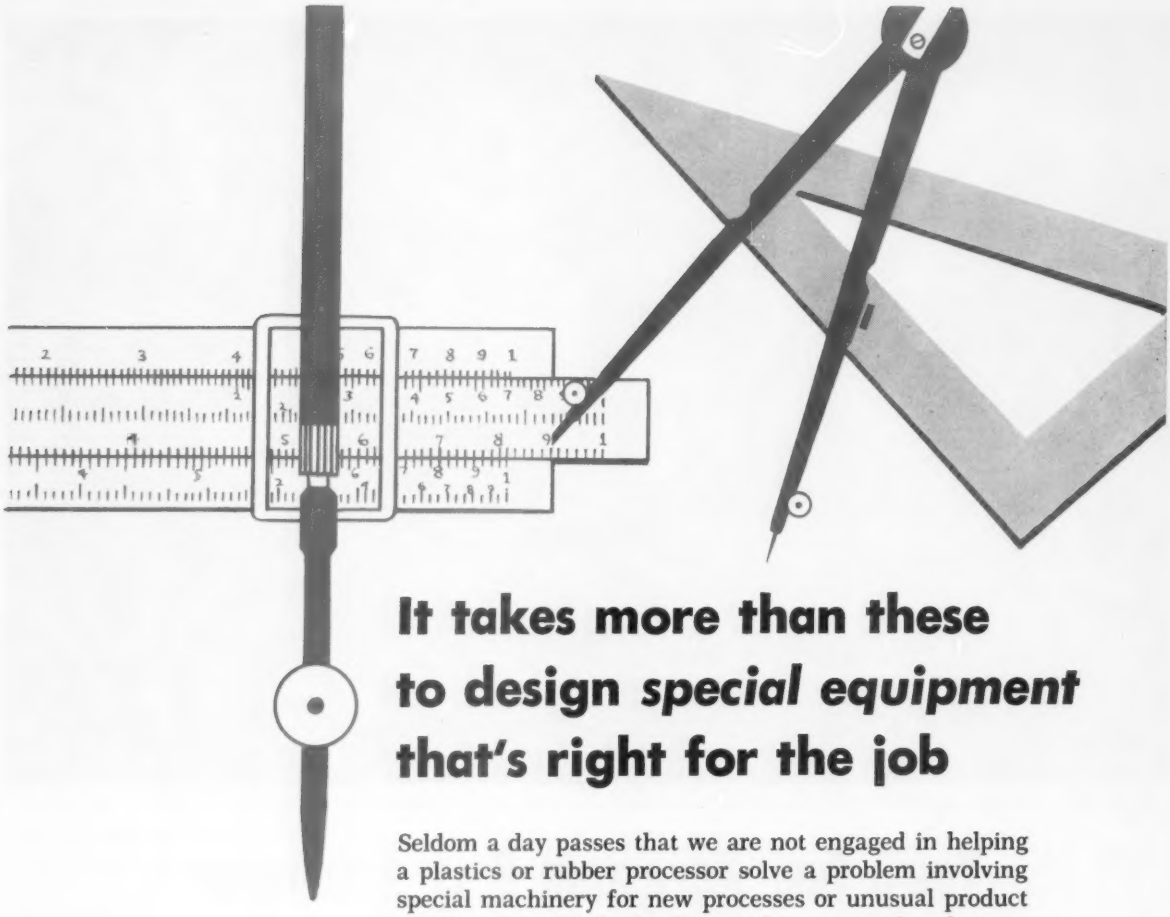

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The foam of the colored, longer-lived, made with PLIOLITE

(Table I)

TYPICAL PROPERTIES OF PLIOLITE LATEX 5352

Total Solids[a]	68.3%
pH[a]	10.2
Surface tension[a] at 40% total solids	39 dynes/cm.
Average particle size[b]	3000 Angstroms
Stabilizer	fatty acid soap
Antioxidant	none
Residual styrene (max.)[a]	0.10%
Coagulum (max.)[a]	0.10% on 80 mesh
Mooney viscosity of contained polymer ML-4[c]	120
Mechanical stability[d]	very good
Gel[e]	0%
Brookfield viscosity, spindle[f] #2	
60% TS at 85° F. at 3 rpm	200 cps.
6 rpm	160 cps.
12 rpm	110 cps.
30 rpm	88 cps.

a ASTM D 1417-57T, American Society for Testing Materials, Philadelphia, Pa.

b W. C. Brown, *J. Applied Phys.*, 18, 273, 1947.

c ASTM D 927-57T.

d W. A. Linbeck and F. E. Woltz, "Stability Test for Latices." U. S. Government, RFC-SPT 153, October 24, 1946.

e Reconstruction Finance Corp., Office of Rubber Reserve Report CR-232, December 22, 1943.

f Brookfield Engineering Laboratories, Inc., Stoughton, Mass.

PLIOLITE LATEX 5352 is the great, new, high solids styrene/butadiene latex specifically designed for use in *top-quality, all-synthetic* foam with these outstanding advantages:

1 Less nonrubber content than any other synthetic latex used for foam

2 Rapid gelation

3 Less mold shrinkage than natural rubber foam

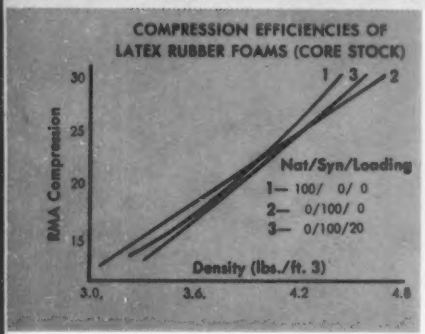
4 Lighter, whiter color than natural rubber latex foam

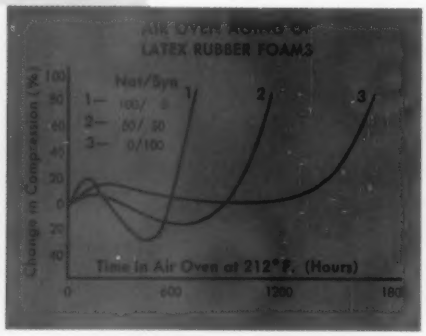
5 Less odor than natural rubber latex foam

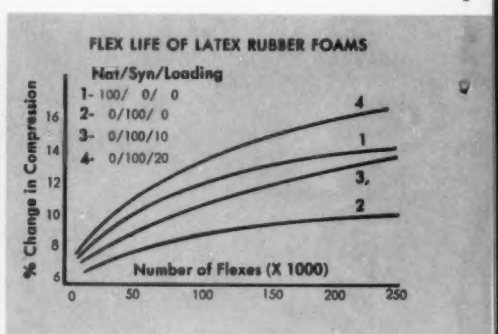
6 Improved aging—about twice as good as natural rubber latex foam

7 Exceptional compression set values

8 Excellent flex life



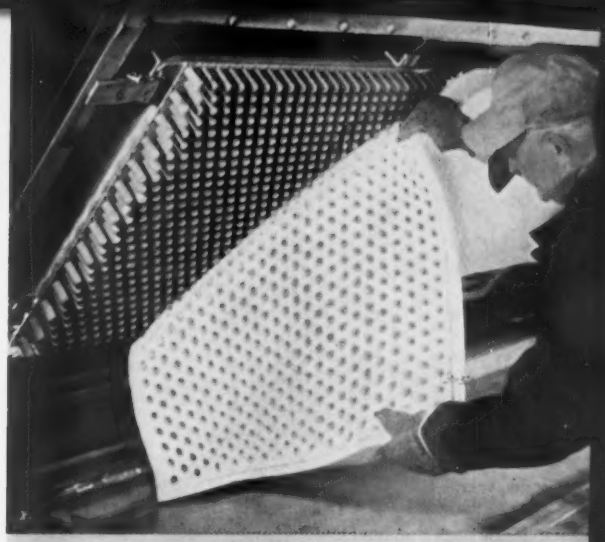




GOOD

future is the lighter-lower-cost foam spectacular, new

LATEX 5352



9 Very good hysteresis and resilience properties

10 Stress/strain properties that are more than adequate for virtually all cushioning applications

11 Low temperature properties that rank second only to natural rubber latex foam

Table I lists the typical properties of PLIOLITE LATEX 5352. Table II compares the properties of foam made with PLIOLITE LATEX 5352 to those of foam made with natural rubber latex.

The charts below are further evidence of the excellent properties of foam made with PLIOLITE LATEX 5352 as compared to natural rubber foam.

But neither the tables nor the charts depict the most important advantage of PLIOLITE LATEX 5352—the much greater assurance of product uniformity and price stability than could ever be possible with a natural product.

(Table II)

PHYSICAL PROPERTIES OF FOAM RUBBER CORE STOCKS

Properties	100% Natural Latex Foam	100% PLIOLITE LATEX 5352 Foam
Tensile strength, psi.[a]	15.0	9.0
Elongation, %[a]	310	225
Compression set[b] (% retention of gauge)		
50% deflection	92.7	96.6
90% deflection	90.0	96.0
Hysteresis loss, %	25.0	26.5
Resilience (rebound in %)[c]	73.0	69.0
Low temperature properties[d]		
(% change @ −20° F.)	10.4	11.0
Flammability[e]	burns	burns

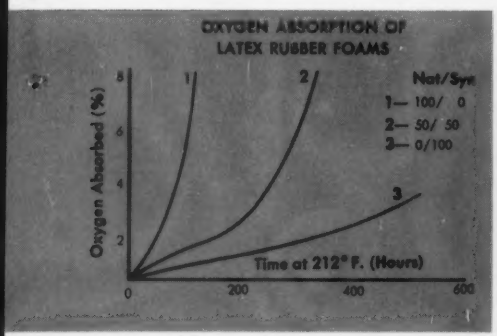
a The tensile and the elongation values of the foam rubber specimen were made on a ½-inch thick cross-section dumbbell specimen, using an inclined plane IP4 tester made by Scott Testers, Inc., Providence, R. I.

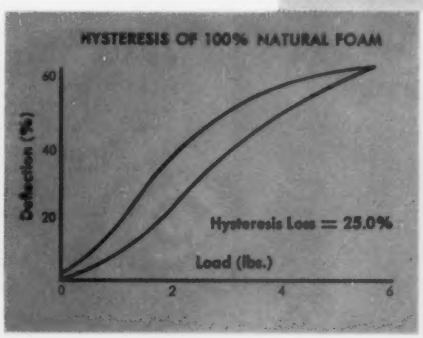
b ASTM D 1055-58T.

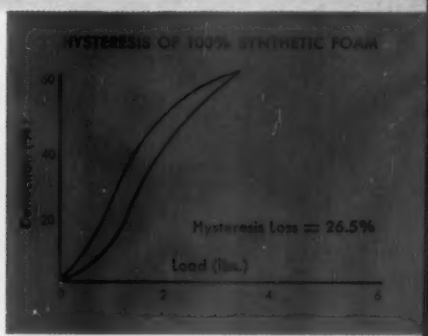
c The resilience was determined by dropping an 8.3 gram steel ball of 1.26 cm. diameter from a height of 20 cm. onto a one-inch-thick sample of slab stock and determining the % rebound of the ball.

d ASTM D 1055-58T, except that temperature was maintained at −20° F. instead of the specified −40° F.

e Flammability was determined by igniting the end of a one-inch-wide by ½-inch-thick slab of foam rubber with a Bunsen burner.







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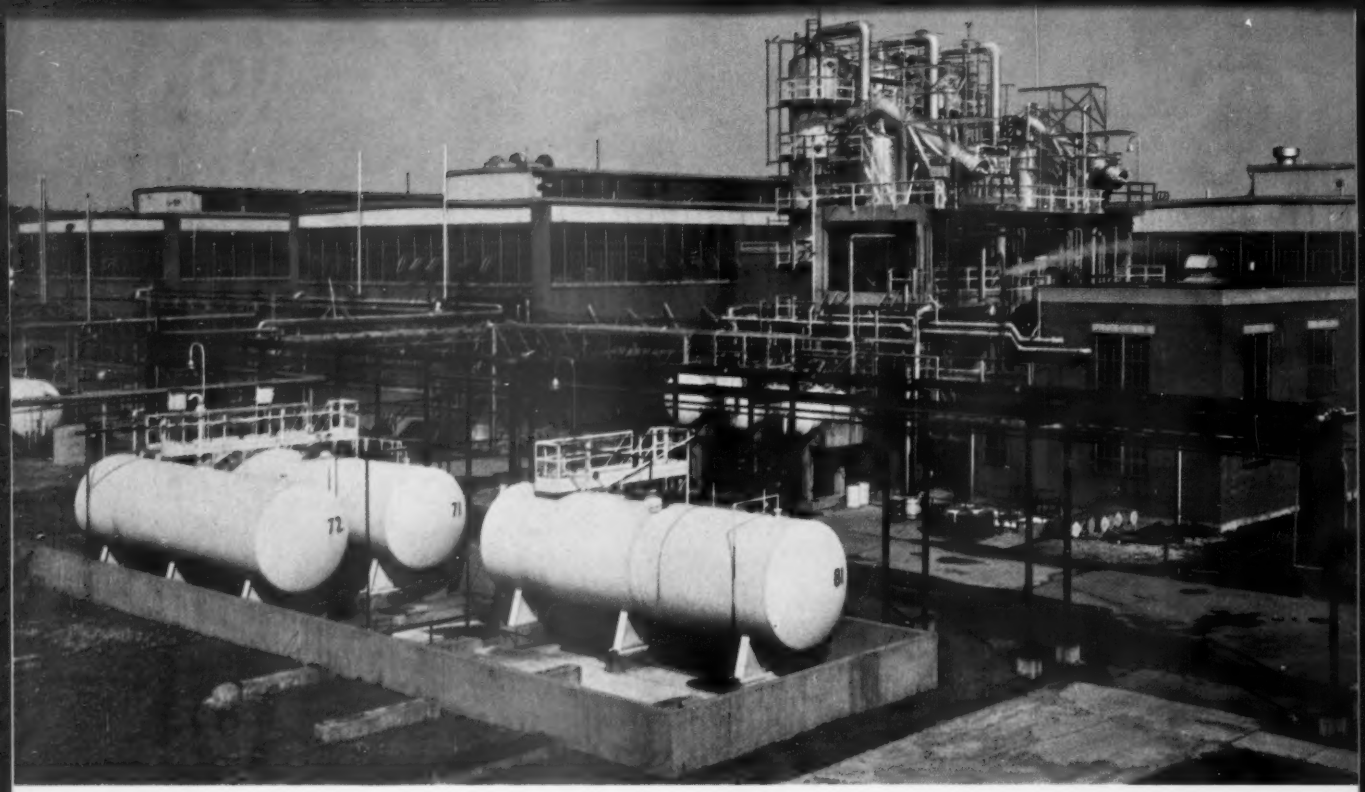


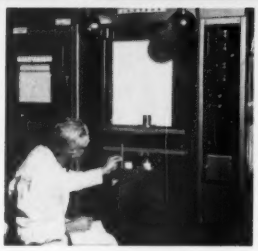
When you purchase PLIOLITE LATEX 5352 for your "foam of the future," you purchase much more than the finest synthetic latex available for virtually any foam application.

In the first place, you purchase the product of a plant with an outstanding production record in synthetic polymers that dates back to the early days of World War II. But even more—because of specialization, extensive physical improvements and expansions—it is a plant which successfully blends years of experience with the largest, most up-to-date latex-producing facilities in the world today.

Here, then, is even further assurance of product quality plus reliable delivery.

However, your purchase of PLIOLITE LATEX 5352 means even more: It brings you the aid of a large staff of strategically located, carefully trained technical salesmen backed by the finest research and development laboratories in the industry. Here a corps of engineers, physicists and chemists is constantly at work, bringing you such outstanding products as PLIOLITE LATEX 5352 and the others in Goodyear's full line of synthetic rubbers, latices and rubber chemicals.

Add the advantages of doing business with one of the rubber industry's largest, most dependable suppliers to the advantages of the product itself and it makes sense to give serious consideration to PLIOLITE LATEX 5352 for your foams of the future.



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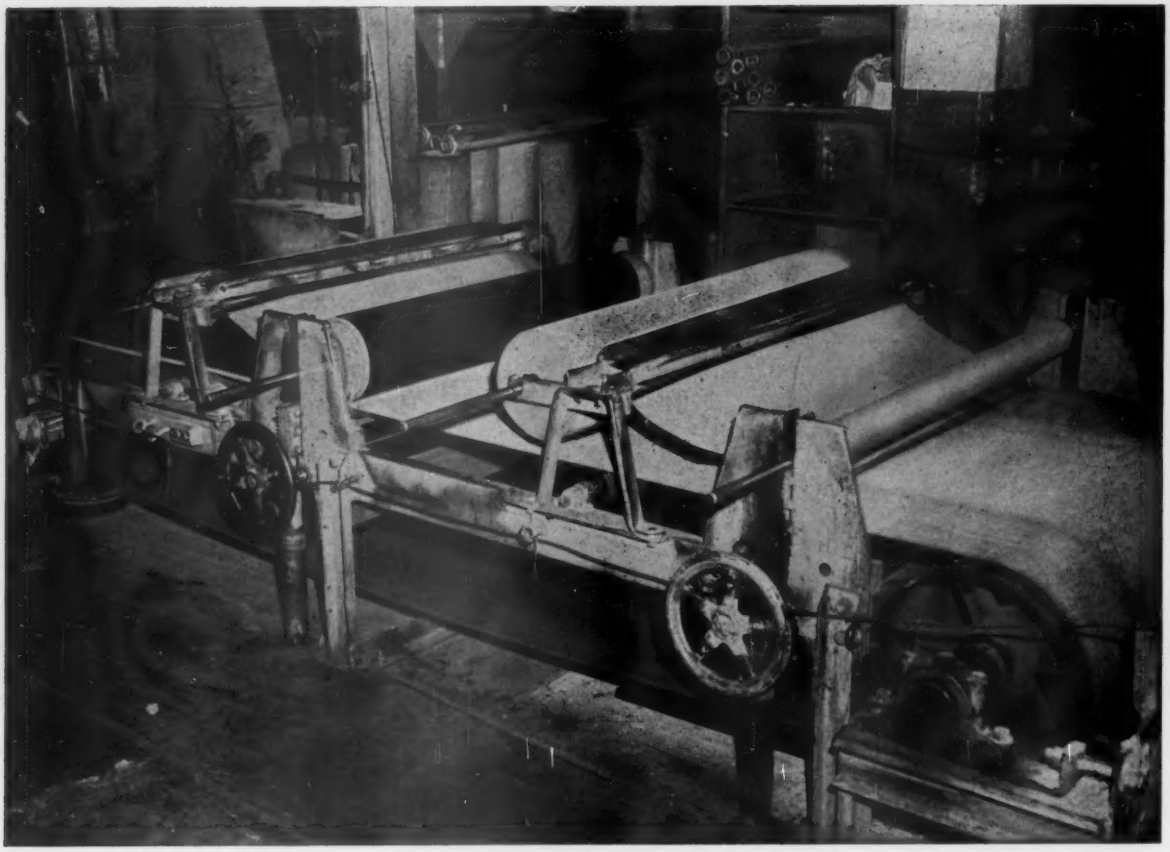

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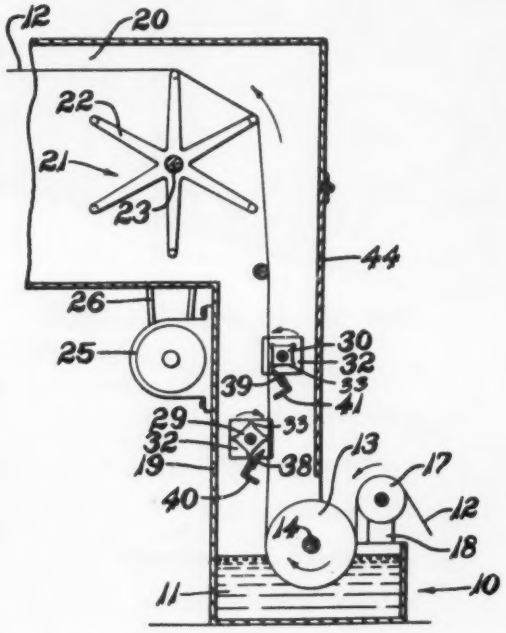
PATENT REVIEW

by Melvin Nord

Cord Treating Apparatus

U. S. Patent 2,889,802, issued June 9, 1959 to Edward T. Lessig and Matthew W. Wilson, assigned to B. F. Goodrich Co., describes an apparatus for treating cords with adhesive liquids, for use as reinforcement in tires, belts and other goods. The invention prevents loose or broken cords from interfering with the operation of the apparatus.

As shown in the schematic diagram, the apparatus consists of an elongated tank or trough (10), which contains a liquid (11) with which the cords (12) are to be treated. Above the forward portion of the trough (10) is a guide roll (17) rotatably supported upon pillars or stanchions (18) at the sides of the tank. Rising above the rear portion of the trough (10) is a housing, including a vertical and an elevated horizontal



portion (20) providing an enclosed passage for the cords being treated. Extending transversely in the horizontal part of the housing (20) is a paddle wheel (21) containing arms (22) supported upon a shaft (23).

The cords (12) are led over the guide roll (17) and beneath the roll (13), so that they pass through the liquid in the trough (10). Then they

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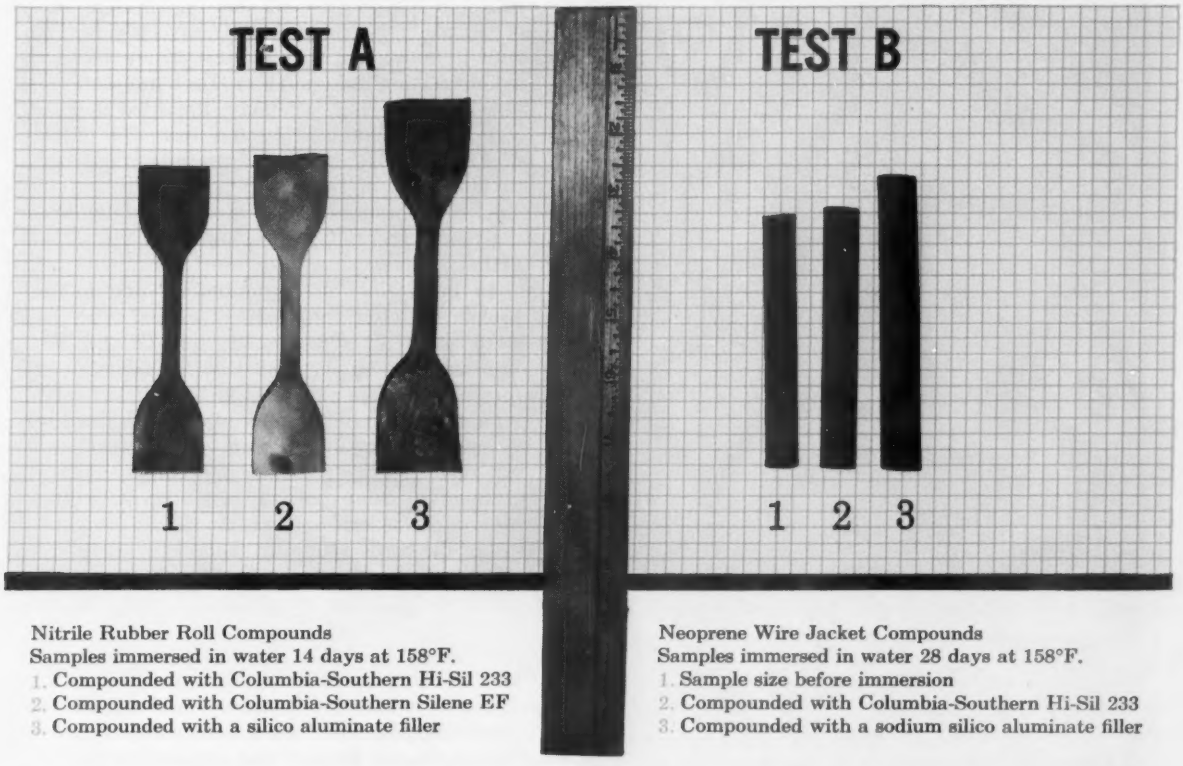

Nitrile Rubber Roll Compounds
Samples immersed in water 14 days at 158°F.
1. Compounded with Columbia-Southern Hi-Sil 233
2. Compounded with Columbia-Southern Silene EF
3. Compounded with a silico aluminate filler

Neoprene Wire Jacket Compounds
Samples immersed in water 28 days at 158°F.
1. Sample size before immersion
2. Compounded with Columbia-Southern Hi-Sil 233
3. Compounded with a sodium silico aluminate filler

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Get the details on these new findings. A full technical report has just been prepared, describing the comparative water absorption of a variety of rubber compounds, both natural and synthetic, and will be sent out to our regular mailing list immediately after publication. Use the coupon to get your copy if you do not regularly receive Columbia-Southern technical literature.

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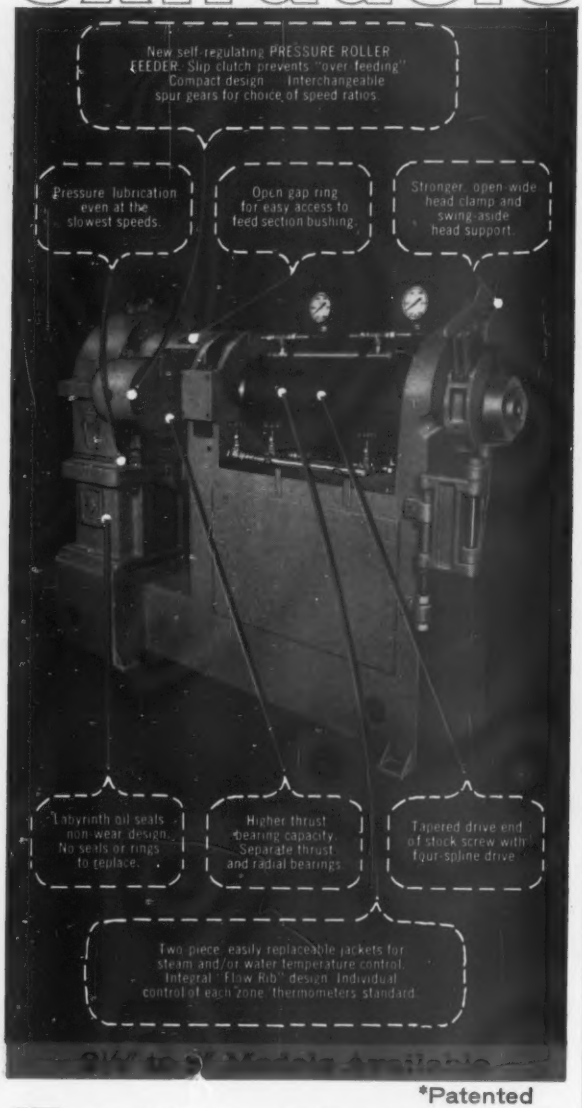
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PATENT REVIEW

move upward through the vertical portion of the housing and over the paddle wheel (21) in the horizontal portion (20) to a drying apparatus.

Excessive liquid should be removed from the cords immediately after they have received the application of the liquid and before they enter the drying apparatus. To accomplish this, the vertical portion of the apparatus is provided with rotatable beaters (29 and 30) on opposite sides of the cords to vibrate them transversely to their path of movement. These beaters are identical in construction and operation. Each has shaft portions at either end, rotatably supported in bearings. As the rotatable beaters turn, the projections (33) strike and move the cords transversely to their path of travel. These impacts and the resulting vibrations shake excessive liquid from the cords, and this liquid returns to the trough (10).

In employing an apparatus of this nature, broken or loose cords tended to fall upon and wrap about the rotatable beaters (29 and 30), this action being aggravated by the adhesive nature of the liquid employed in treating the cords. As such broken or loose cords wrapped about the vibrator beaters, they tended to pull other cords out of their proper path of movement, to break them or to cause tangling and other difficulties. Hence, it was necessary to free the rotating beaters of the cords wrapping about them as soon as this condition was observed.

These difficulties are obviated by the provision of clearer members adjacent to each of the rotatable beaters (29 and 30) which prevent broken or loose cords from wrapping around the beaters. These members are illustrated as longitudinally extending plates or bars (38 and 39, respectively), supported beneath and adjacent to the path of movement of the radially projecting portions (33) on the beaters (29 and 30). The clearer members (38 and 39) are at an angle, so that they are tangential to the cylindrical path traced (38, 39) is sharpened to present a knife edge, and the members are so adjusted that the clear- by the projecting edges (33).

The outer end of each of the clearer members ance between this knife edge and the radially projecting portions (33) of the beaters at its closest is less than the diameter of the cord being

Copies of any patents, including those described here, are available from the Commissioner of Patents, Washington 25, D.C., for 25 cents each. Do not send stamps.

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Color (Gardner): 10-11
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PATENT REVIEW

treated. The construction is such that, if a loose or broken cord tends to wrap around either of the beater members (29, 30), the cord will be scraped or cleared from the beater by the cooperating member (38 or 39). The cords thus removed from the beater will drop downward in the housing portion and can be removed by the operator. Access to this portion of the apparatus for servicing and for removing such cords can be attained by providing a hinged door or removable panel (44) in the vertical portion of the housing.

Manufacture of Butyl Inner Tubes

U. S. Patent 2,888,059, issued May 26, 1959 to Goodyear Tire and Rubber Co., discloses a method of manufacturing butyl rubber inner tubes.

In the first step of the process a length of tubular stock of butyl rubber is formed. This is cut to the desired length while it is in a flat position. The flattened ends of the cut stock are butted together to form a spliced flat tube. The spliced area of the flat tube is placed between surfaces spaced apart a distance less than the sectional diameter of the inflated tube. The tube is then inflated so that, as the tube expands, the crown portion of the spliced area engages one of the surfaces, and the area is held in an elliptical cross-sectional shape. The spliced area is maintained between the surfaces until the stock in the area has stabilized. The spliced area is then removed from contact with the surfaces, and the inflated tube is placed in a mold and cured.

Other Patents of Interest

Subject	Inventor or Assignee	Patent No.	Date
Polychloroprene elastomers	E. I. du Pont de Nemours & Co.	2,868,764	4/13/59
Apparatus for testing tires or belts	Dunlop Tire & Rubber Corp.	2,869,361-2	1/20/59
High-speed tire	United States Rubber Co.	2,869,610	1/20/59
Retread mold	General Tire & Rubber Co.	2,886,851	5/19/59
Pneumatic tire building apparatus	Cleveland Trust Co.	2,887,148	.....
Stabilized latex coating compositions	Dow Chemical Co.	2,887,460	.....
Chafer strips for tubeless tires	Goodyear Tire & Rubber Co.	2,888,058	5/26/59

Photo courtesy Beebe Rubber Company, Nashua, N. H.

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GOODYEAR

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Plioflex–T. M. The Goodyear Tire & Rubber Company, Akron, Ohio *TM–Ripple Sole Corporation

Photo taken through the courtesy of Charleston Rubber Company, Charleston, S. C.

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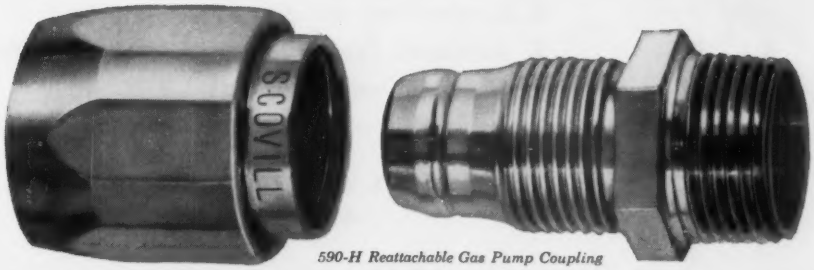
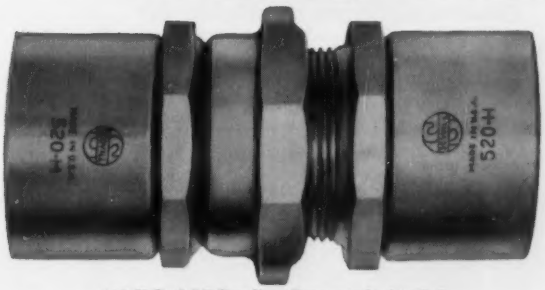
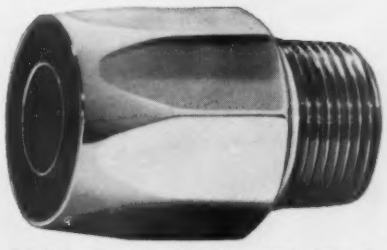


590-H Reattachable Gas Pump Coupling



520-H Fuel Oil Coupling, Permanently Attached



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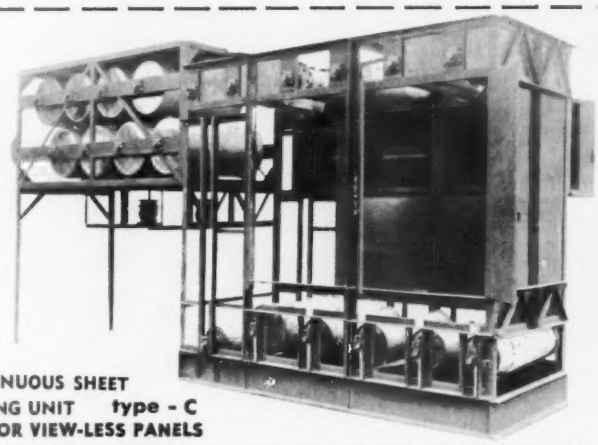

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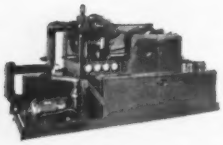

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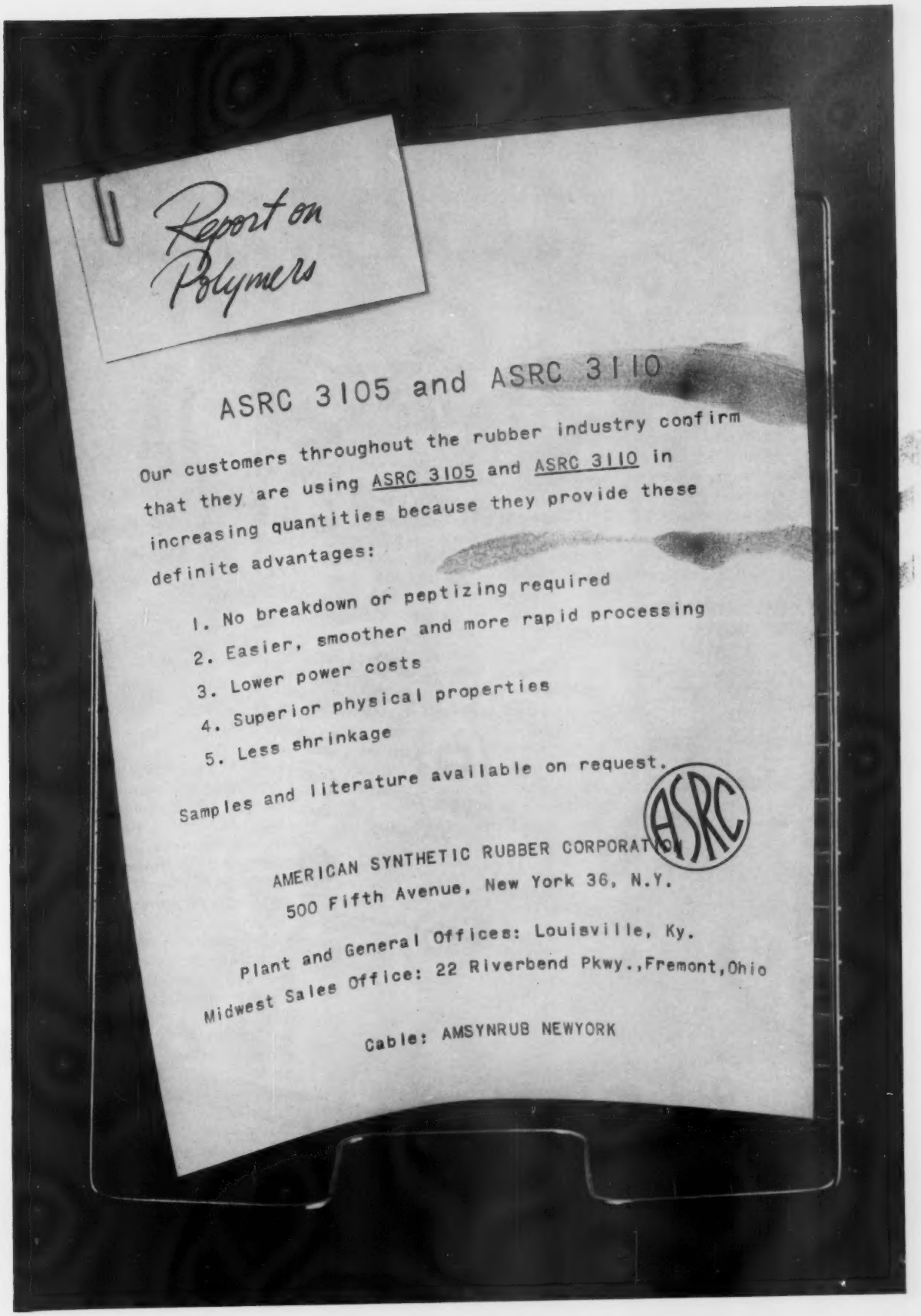
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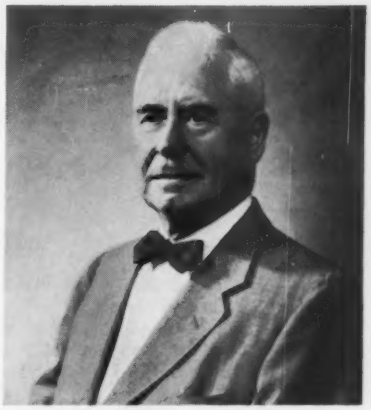
1959 Charles Goodyear medal awarded

to Dr. Fernley H. Banbury



His invention, the Banbury® mixer, is still growing in importance after 43 years

One of the first Banbury mixers built. A size 3 machine, it had a batch capacity of 100 to 125 pounds.

The Charles Goodyear Medal – highest honor in rubber chemistry – is awarded annually by the American Chemical Society's Division of Rubber Chemistry. This year it was presented to Dr. Fernley H. Banbury on November 12th at the International Rubber Conference, Washington, D. C.

Dr. Banbury has contributed much to the mechanization of the rubber industry. Until 1916, when he joined Birmingham Iron Foundry with his patent for an internal mixer, plasticizing and mixing of rubber was always done in roll mills. After the introduction of the Banbury mixer, industry leaders discovered that they could vastly increase output while improving quality in mixing and compounding rubber stocks.

It is interesting to note that originally Banbury mixers were identified according to the number of mills they could displace. Thus, the size 3 Banbury shown above, which was built for Goodyear in 1916, could do the work of three 60" mills. The larger sizes—9, 11 and 27—were numbered according to the relation of their capacities to that of the size 3.

Today, acceptance of internal mixing has reached the point where there is scarcely a rubber or plastics plant in America that does not have one or more Banburys. And these machines are used extensively throughout the rest of the world.

During the Banbury mixer's history, Farrel-Birmingham has carried on a program of improvement in design and construction as well as in service dependability. Drive power has been steadily increased, efficiency of operation raised.

The company has developed the Banbury mixer for such modern processing techniques as high-pressure mixing for shorter cycles, the grinding and reclaiming of cured rubber stocks, and the dewatering of natural and synthetic rubber. Success in the rubber field has led to its use for the mixing of plastics, cellulose acetate, asphaltic materials, linoleum and other compounded products.

Dr. Banbury retired as active manager of the Banbury mixer department of Farrel-Birmingham Company in 1944, but continued his association with the company as a consultant. In all those years, Dr. Banbury never felt that his invention had fully satisfied all of its potentialities for new applications – and he still does not think so.

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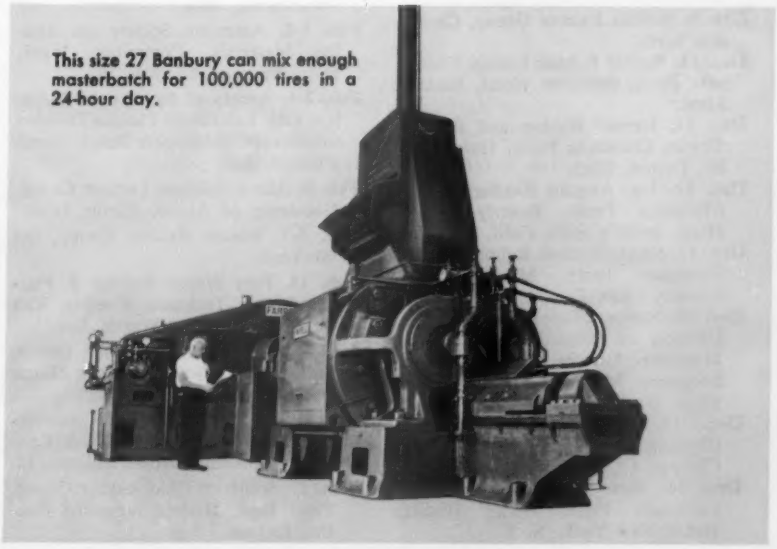

This size 27 Banbury can mix enough masterbatch for 100,000 tires in a 24-hour day.

coming events

1959

Nov. 19. Quebec Rubber & Plastics Group, Technical Meeting.

Nov. 24. Manufacturing Chemists' Association, Ninth Semi-Annual Midwinter Meeting, Hotel Statler, New York, N. Y.

Nov. 29-Dec. 4. ASME Annual Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.

Nov. 30-Dec. 4. 27th Exposition of Chemical Industries, New York Coliseum, New York, N. Y.

Dec. 1-3. U. S. Army Signal Research and Development Laboratory, Wire and Cable Symposium, Berkeley-Carteret Hotel, Asbury Park, N. J.

Dec. 2. Southern Ohio Rubber Group, Technical Meeting, Engineers Club, Dayton, Ohio.

Dec. 2. Synthetic Organic Chemical Manufacturers Association, Roosevelt Hotel, New York, N. Y.

Dec. 3. Fort Wayne Rubber & Plastics Group.

Dec. 3-5. American Chemical Society, Southwest Regional Meeting, Capital House, Baton Rouge, La.

Dec. 4. Akron Polymer Lecture Group, University of Akron, Akron, Ohio.

Dec. 6-10. American Institute of Chemical Engineers, Annual Meeting, San Francisco, Calif.

Dec. 7-8. Toy Manufacturers of the U.S.A., Annual Meeting, Hotel Biltmore, New York, N. Y.

Dec. 7-9. Chemical Specialties Manufacturers Association, Annual Meeting, Mayflower Hotel, Washington, D.C.

Dec. 7-10. National Conference on the Application of Electrical Insulation, Shoreham Hotel, Washington, D. C.

Dec. 8. Buffalo Rubber Group, Christmas Party.

Dec. 11. Boston Rubber Group, Christmas Party, Somerset Hotel, Boston, Mass.

Dec. 11. Detroit Rubber and Plastics Group, Christmas Party, Hotel Statler, Detroit, Mich.

Dec. 11. Los Angeles Rubber Group, Christmas Party, Beverly Hilton Hotel, Beverly Hills, Calif.

Dec. 12. Southern Ohio Rubber Group, Christmas Party, Miami Valley Country Club, Dayton, Ohio.

Dec. 17. National Bureau of Standards, Division of Organic and Fibrous Materials, Lecture Series on High Polymers, Materials Testing Laboratory, Washington, D. C.

Dec. 18. Chicago Rubber Group, Christmas Dance, Hotel Morrison, Chicago, Ill.

Dec. 18. New York Rubber Group, Christmas Party, Henry Hudson Hotel, New York, N. Y.

Dec. 27-30. American Statistical Association, Shoreham Hotel, Washington, D. C.

Dec. 28-29. American Chemical Society, Division of Industrial and Engineering Chemistry, Christmas Symposium, Johns Hopkins University, Baltimore, Md.

1960

Jan. 8. Akron Polymer Lecture Group, University of Akron, Akron, Ohio.

Jan. 9-15. Eleventh International Toy Fair, Harrogate, England.

Jan. 12-15. Society of Plastics Engineers, 16th Annual Technical Conference, Conrad Hilton Hotel, Chicago, Ill.

Jan. 20. Southern Ohio Rubber Group, Technical Meeting, Engineers Club, Dayton, Ohio.

Jan. 21. National Bureau of Standards, Division of Organic and Fibrous Materials, Lecture Series on High Polymers, Materials Testing Laboratory, Washington, D. C.

Jan. 21. Quebec Rubber & Plastics Group, Joint Technical Meeting with the Society of Plastics Engineers.

Jan. 25-28. Plant Maintenance & Engineering Show, Convention Hall, Philadelphia, Penna.

Jan. 29. Akron Rubber Group, Technical Symposium, Sheraton Hotel, Akron, Ohio.

Jan. 29. Chicago Rubber Group, Technical Meeting, Furniture Club, Chicago, Ill.

Jan. 30-Feb. 3. National Automobile Dealers Association, 43rd Annual Convention, Sheraton Park Hotel, Washington, D.C.

Feb. 1-5. American Society for Testing Materials, Committee Week, Hotel Sherman, Chicago, Ill.

Feb. 2-4. Society of the Plastics Industry, 15th Reinforced Plastics Division Conference, Edgewater Beach Hotel, Chicago, Ill.

Feb. 5. Akron Polymer Lecture Group, University of Akron, Akron, Ohio.

Feb. 5-7. Boston Rubber Group, Ski Weekend.

Feb. 11. Fort Wayne Rubber & Plastics Group, Technical Meeting, Van Orman Hotel, Fort Wayne, Ind.

Feb. 12-13. Southern Rubber Group, Technical Meeting, Shamrock Hilton Hotel, Houston, Texas.

Feb. 14-18. Hobby Industry Association, American Trade Show & Convention, Sherman Hotel, Chicago, Ill.

Feb. 17. Southern Ohio Rubber Group, Plant Tour, Modern Industrial Plastics, Dayton, Ohio.

Feb. 19. Connecticut Rubber Group, Technical Symposium, Waverly Inn, Cheshire, Conn.

Feb. 25. National Bureau of Standards, Division of Organic and Fibrous Materials, Lecture Series on High Polymers, Materials Testing Laboratory, Washington, D. C.

Feb. 26. Quebec Rubber & Plastics Group, Ladies' Night Dance, Victoria Hall, Montreal, Quebec, Canada.

March 4. Akron Polymer Lecture Group, University of Akron, Akron, Ohio.

March 6-11. Tenth International Toy & Trade Fair, Hotel Statler Hilton, New York, N. Y.

March 7-16. American Toy Fair, Hotels New Yorker and Sheraton-Atlantic, New York, N. Y.

March 10-13. Pacific Automotive Show, City Auditorium, Denver, Colo.

March 11. Chicago Rubber Group, Technical Meeting, Furniture Club, Chicago, Ill.

March 17. National Bureau of Standards, Division of Organic and Fibrous Materials, Lecture Series on High Polymers, Materials Testing Laboratory, Washington, D. C.

March 17. Quebec Rubber & Plastics Group, Technical Meeting.

March 30-31. Plastics Institute Conference on Polymeric Progress, William Beveridge Hall, London University, London, England.

April 1. Akron Polymer Lecture Group, University of Akron, Akron, Ohio.

April 5-14. American Chemical Society, 137th National Meeting, Cleveland, Ohio.

April 8. Akron Rubber Group, Technical Symposium, Sheraton Hotel, Akron, Ohio.

April 8-9. Society of the Plastics Industry, 17th Western Section Conference, New Riviera Hotel, Palm Springs, Calif.

April 14. Fort Wayne Rubber & Plastics Group, Technical Meeting, Van Orman Hotel, Fort Wayne, Ind.

April 20. Quebec Rubber & Plastics Group, Technical Meeting.

April 25-26. Society of the Plastics Industry (Canada), 18th Annual Canadian Section Conference, London Hotel, London, Ontario, Canada.

May 6. Akron Polymer Lecture Group, University of Akron, Akron, Ohio.

May 7-13. Society of the Plastics Industry, National Conference and Annual Meeting, Cruise on the *Queen of Bermuda*.

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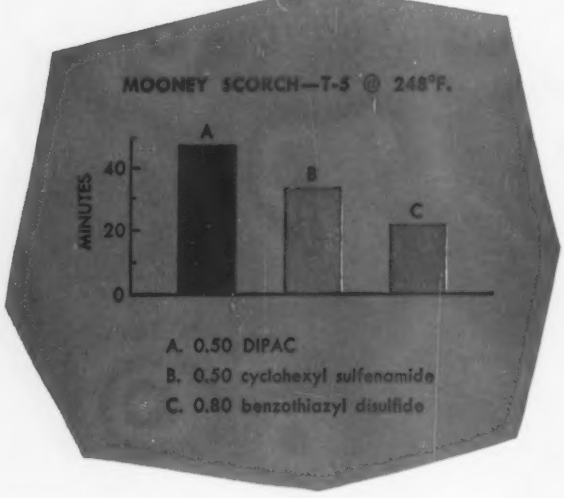

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As Soule Sees It...

by Kenneth J. Soule

Germ-Free Worlds Made To Order

Writing in the RUBBER AGE, of February, 1959, I commented on the whys and wherefores of the meticulous sterilization of rockets destined for interstellar space, or more particularly for those missiles expected to contact planets outside the earth's atmosphere. The logical explanation for these procedures appeared to lie in the necessity, or at least the desirability of preventing contamination of any germ-free areas which might be contacted, or of swapping infections with any new worlds encountered which already possessed specific bacteria of their own.

The idea of maintaining antiseptically pure rockets, earth satellites, moon-niks, and what-have-you, in order not to disturb the germ *status quo* in the universe, leads naturally to the general subject of what a germ-free world would be like—if it could be realized. Fisher Scientific Company's excellent trade journal, *The Laboratory*, (Vol. 27, No. 5) discusses this and related matters in a fascinating article entitled, "Worlds Without Germs."

Historically, the question of a germ-free world has intrigued and puzzled scientists for the past seventy-five or eighty years. Louis Pasteur, the eminent French biologist, was of the opinion that life without germs would be impossible, and to test this theory suggested experiments starting with fertile hen's eggs, kept germ-free by whatever means possible.

A number of research bacteriologists took up the challenge and struggled long and valiantly to carry out the work necessary to prove or disprove Pasteur's theory. Ingenious machines were developed in an attempt to provide and maintain germ-free enclosures for the eggs and chickens under study, but ultimately the subjects died from malnutrition, or contamination took place.

Undaunted by these set-backs, other researchers continued the struggle. Finally, in 1959, success has been realized; germ-free chickens, guinea pigs, rats, mice and rabbits have been born and have thrived. This has been made possible primarily by the development of small glass and steel enclosures (measuring roughly 3 feet by 2 feet by 2 feet) which can be rendered bacteria-free *and maintained* in this condition. This is done by sterilizing all the food, air, instruments, and equipment entering the units, and by introducing germ-free animal subjects into the enclosure via a sterile Caesarean section. Manipulation from inside, or within the aseptic chamber is accomplished through the medium of neoprene gauntlet gloves which are a built-in part of the equipment.

Another technical advance which has contributed greatly to the present development is the successful use of radiation for food sterilization. Previously, steam was used for this purpose, but in many cases, this resulted in loss of vital nutritional elements from the food.

Many interesting and important facts have been discovered thus far in these investigations. It will only be possible to mention a few of these here:

(1) Continuously germ-free baby chicks, fed a balanced diet, grow and thrive as well as their country cousins born and raised under "normal" conditions. (This answers Pasteur's question.)

(2) Rats, born and raised in these antiseptic homes "are not susceptible to dental caries—" in other words their teeth do not develop cavities or decay.

(3) A special strain of white rats, born and maintained under bacteria-free conditions do *not* develop cancer, although all of their female relatives for many generations back, living under standard conditions, have developed breast cancer. (In this connection, the famous cancer specialist, Dr. George T. Pack, believes that "almost everyone" has had cancer at one time or another during his lifetime, but many people never even know they have had it. This is true because "man has a tremendous resistance to cancer in his system due to immune factors in the blood stream." Dr. Pack believes that the best approach to the eventual control of cancer lies in an intensive study of how and why this built-in immunity often breaks down.)

(4) Animals whose entire lives have been spent in germ-free atmospheres succumb rather quickly when exposed to the ordinary air which we commonly think of as being clean and pure. However, if the exposure is of short duration, or a moderate amount of time for adjustment is provided, the animals respond in much the same way as do their unpampered relatives. In other words, they gradually develop or build up resistance to the new germs which they have just met for the first time.

Future space travelers similarly may find it necessary to linger and wait before entering new atmospheres in order to allow for bodily adjustments, and the building of barriers against new and alien germs.

Stocks, Bonds and Conveyor Belts

Ordinarily, there seems to be little connection between conveyor belts and the Stock Market, but at least one company member of the New York Stock Exchange has demonstrated that the two subjects can operate closely and profitably together. The company in question is Goodbody and Co., which has just moved into new and spacious offices at 2 Broadway in New York City after a 40 year stint a few blocks further uptown. The new floor space totals 75,000 square feet and the equipment includes fifteen closed circuit television receivers, an R.C.A. 501 high speed computer, and the "longest straight line conveyor belt in the industry."

The 143 foot belt is built up of two plies of light fabric impregnated with white neoprene and with the cut edges coated with the same material. The belt, or rather the several narrow belts making up the assembly,

As Soule Sees It (Cont'd)

were made endless on the job. They run over pulleys beneath a series of ten upright aluminum spacers which serve to provide slots into which the many operators place order slips, routed by a series of push buttons to other clerks along the line. The belt assembly is a sort of split-level arrangement, which Goodbody chooses to call a "two-tiered" job. A would-be comedian claims that this represents one tear for customers buying too late, and another for those selling too soon.

In any case, the set-up is most versatile, and it is fascinating to watch the slips of paper dash unerringly to their pre-set destinations, like stars in their orbits.

gum — Gum — GUM!

Although CHEWING GUM has been an article of commerce in these United States since the early 1800's, it is extremely doubtful if many people are aware that rubber is the one basic ingredient which is essential to this chewy product, as we know it today. Of course, historically, this is not strictly true, since the first commercially marketed chewing gum in this country consisted entirely of a resinous exudation from the Spruce tree, known as spruce gum. This apparently met public favor. Unfortunately the supply of raw material was not sufficient to fill the manufacturing quota, and spruce gum died an untimely death.

However, the gum chewers were not to be denied, and at about 1860, gum with a rubber content of approximately 20 per cent made its debut on the American scene. The rubber in this case was chicle, a resinous, resilient substance derived from the latex of the *Sapodilla* or *Naseberry* tree, a native of Yucatan and Guatemala. The choice of the particular type of rubber and the percentage used in the finished product proved to be a particularly happy one since it established a pattern which has persisted up to the present time.

It is true that the supply of chicle was unequal to the skyrocketing demands made upon it as gum chewing achieved ever increasing popularity, and the use of additional supplementary rubbers became necessary. Among these were Jelutong (Pontianak) a highly resinous product from the East Indies, Sorva and Leche Caspe from the Amazon Valley, and many other wild rubbers. Vinyl resins, micro-crystalline waxes and synthetic rubbers such as butyl and SBR are now also used in the rubber matrix. As with all important rubber products, each manufacturer has his own pet formulae and his own preferred mixing and handling procedures.

Each producer also guards most zealously the quality and uniformity of his product, and constantly tests, inspects, and controls the finished article to protect its hard-earned reputation. Since gum is also classed as a food product, all stages of final manufacture and packaging are carried out under aseptically maintained conditions. The final packaging of the purified and sterile chewing gum in stick form is handled by intricate and ingenious machines. These wrap the individual sticks in paper-lined metal foil, place five wrapped sticks together in a cellophane and paper unit complete with a quick-opener tape, and finally seal the ends of the package.

Besides the familiar sticks of chewing gum, the product is also marketed in pellets, balls and strips. There are a number of specialty types, such as bubble, dietetic, medicinal, licorice (Black Jack), etc. However, about 85-90 per cent of all the gum sold is marketed in stick form, and it is this type which has shown a consistently spectacular growth over the years. For instance, in 1914, the per capita consumption of gum in the United States was 39 sticks; in 1939 the figure had reached 98 sticks, and in 1958, about 215 sticks. Converting the 1958 figure to total pounds of stick chewing gum consumed in this country, we arrive at the staggering total of 250 million pounds (which is a quarter of a billion pounds, unless my mathematics are playing tricks again.) This astronomical figure is made up of about 50 million pounds of rubber(s), 50 million pounds of corn syrup, 150 million pounds of sugar, and relatively minor amounts of flavorings, colors, and other specialty ingredients. Big business in anybody's language!

The chewing of gum is no doubt indulged in by most people for the sheer pleasure derived. It is said, however, that the use of chewing gum rises greatly during periods of social tensions, since the act of continued chewing tends to relieve stresses and soothe the nerves. This may explain to a considerable extent the steep rise of chewing gum consumption over the past 40 years, for the world has rarely been in a completely calm and peaceful state for very long periods during that time.

Correction Please

In the article on Roofs, in this column Sept. 1959, I had occasion to say:— "We also note that butyl rubber compositions are being recommended as do-it-yourself coatings for wood shingle roofs." This was all right as far as it went, but it didn't cover enough territory since butyl roof coating was also being recommended for use on asphalt shingle and roll roofing. In fact, at least one of the major mail order houses was offering it with a fifteen-year guarantee and in a variety of pastel colors. A butyl-base caulking compound was likewise available for use around chimneys, butt joints, and for similar preliminary patching jobs.

Later on, as recently as October 10, 1959, in fact, some of the New York City Sunday newspapers carried a quarter-page advertisement for "new BUTYL-COAT, the amazing, miracle Rubber Roof Coating." Here also, pastel colors were offered and a fifteen-year life guaranteed. Since the advertisement was quite flamboyant in its claims and method of presentation, it is probably not surprising that the following statement was made:— "Demand for Butyl-Coat far exceeds supply, avoid disappointment. Rush order TODAY— Available only from——" (the advertiser).

The potential market in this country for such a coating is obviously very great. How much of it will be realized remains to be seen.

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SUNDEX 1585. A highly aromatic oil for oil-extended SBR polymers where ease of processing and optimum aromaticity are required.	**CIRCOSOL 2XH.** A general-purpose softener and extender for SBR polymers 1703, 1708, etc. (37.5 parts Circosol 2XH to 100 parts polymer), and for light-colored rubber goods requiring optimum physicals.	**SUN PROCESS AID 521.** Nonstaining, highly paraffinic oil-extender for butadiene-styrene polymers. Low volatility, medium viscosity, fair processing ability.
SUNDEX 85. Especially recommended for very high loadings of WHV neoprene (from 75 to over 100 parts oil to 100 parts polymer). Compatible with natural rubber, SBR polymers, acrylonitrile polymers.	**CIRCOSOL 596.** Light-colored, interchangeable with Circosol 2XH when light color is especially important in finished products, as in mastic floor tile.	**SUN PROCESS AIDS 511, 531, 551.** Highly paraffinic oils providing a wide range of properties for nonstaining, low-temperature applications in natural rubber and butadiene-styrene polymers. Ask the Sun man for details.
SUNDEX 170. This oil was developed specifically for use in compounding mastic floor tile, battery cases, and resinous binders.	**CIRCOSOL NS.** Primarily an extender recommended where *maximum* nonstaining and color stability are required for white and light-colored vulcanizates.	**WANT MORE INFORMATION?** Call the Sun representative near you, or write for a copy of our new brochure "Compounding Oils for Natural Rubber and Synthetic Polymers." SUN OIL COMPANY, *Philadelphia 3, Pa., Dept. RA-11.* In Canada: Sun Oil Company Limited, Toronto and Montreal.
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News in Brief

► Durez Plastics Division of the Hooker Chemical Corp., North Tonawanda, N.Y., has published an eight page, newly revised products list which contains general data on properties and uses of thermosetting phenolic and diallyl phthalate molding compounds, fire-retardant Hetron polyester resins for reinforced plastics and phenolic resin for bonding and coating. Ask for Bulletin No. D400.

► New technical data on Synpol SBR has been published by Texas-U.S. Chemical Co., New York, N.Y.. Included are data sheets on Synpol grades 8200, 8201 and four ultra-dispersed black masterbatches—Synpol grades 8251, 8253, 8254, and 8255.

► Bulletin No. 9, in the series of Enjay Butyl Bulletins, reports on the use of ultra-accelerators with Enjay Butyl. It is available from Enjay Co., New York, N. Y.

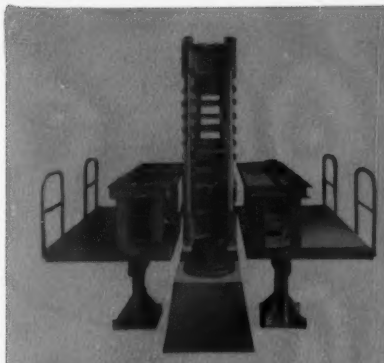
► Service Managers Committee of the Rubber Manufacturers Association, New York, N.Y., has published two wall display posters as part of its effort through educational material to promote highway safety and assure satisfactory tire service to motorists. One bulletin, measuring 17x22 inches, is entitled "Safety Precautions You must Observe When Mounting or Demounting Automobile Tires" and the other, measuring 22x34 inches, is entitled "Why Tires Wear Fast or Fail Early."

► An eight page brochure describing in detail Neothane castable polyurethane rubber, has been published for design, development and research engineers, by Goodyear Tire & Rubber Co., Akron, Ohio. Ask for Brochure S-5125.

► B. F. Goodrich Chemical Co., a division of B. F. Goodrich Co., Cleveland, Ohio, has made available a 16 page technical newsletter which describes the properties and uses of Hycar 1203.

► Goodyear Tire & Rubber Co., Akron, Ohio, has issued two four-page *Tech Book Facts*, one on Plioflex 1712C and the other on Plioflex 1500C. Request Bulletins PF-26 and PF-27, respectively.

► A new, eight-page catalog highlighting major General Electric silicone products and their uses is available from the Silicone Products Department, General Electric Co., Waterford, N. Y. Designated CDS-129A, this illustrated publication lists additional specialized literature covering product and application information as well as major G-E silicone products.



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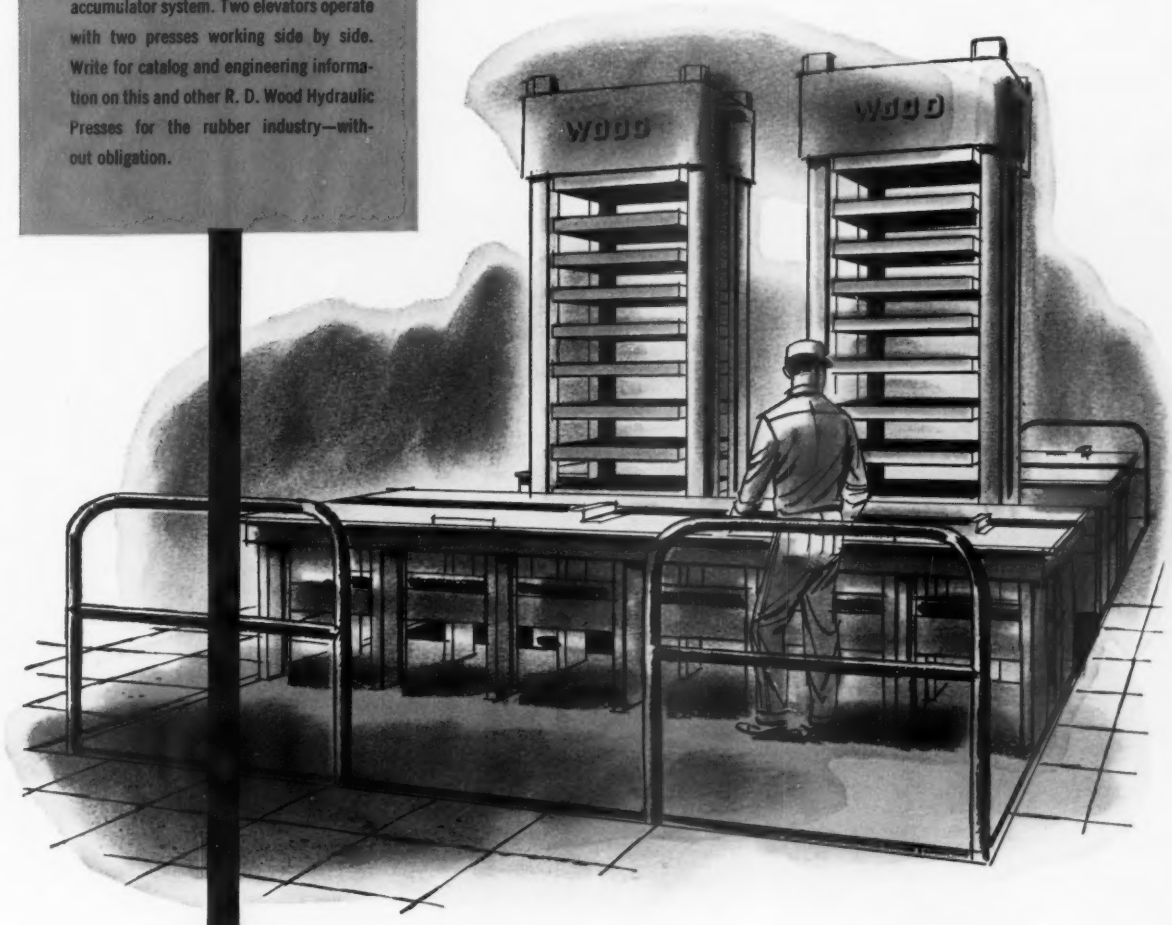

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Loading a bale of light-colored synthetic rubber into a Flotainer® package at the Torrance, California, plant of Shell Chemical Corporation

6

1

Light-Colored S-1006 is a hot, non-discoloring, non-staining, color-stable polymer which finds extensive use in light-colored, molded or extruded goods and applications where extreme whiteness and good aging resistance are demanded. The finished product reflects the whiteness of the bale.

2

Light-Colored S-1011 is a unique gel-free polymer that is used in adhesives and sealants. It is a hot rubber and is non-staining and non-discoloring . . . just the answer for white adhesive applications such as medical tape, and for various sealants which require outstanding color properties.

3

Light-Colored S-1502 is a non-discoloring and non-staining general-purpose rubber. Its exceptional balance of physical properties makes it one of the most popular COLD polymers. S-1502 offers you high strength and long wear as well as excellent original color and color stability.

good ways to whiter, brighter rubber products

For rubber products that are *whiter* than ever before . . . for colors that are *brighter* than ever before . . . Shell Chemical brings you six rubber S-Polymers that are lighter in color than you ever thought possible.

If you make tennis shoes or whitewall tires; bathing caps or floor tiles; crepe soles or wringer rolls . . . one of the six light-colored S-Polymers below can improve product color and reduce costs.

With clear, color-stable Shell S-Polymers, you'll need less whitener to mask unwanted dark tones, and lower levels of other pigments to obtain a wide spectrum of brilliant colors.

Efficient methods for producing lighter colored S-Polymers were developed by Shell's extensive research program—one of the world's largest devoted to synthetic rubber. Other advances include: improved shipping containers such as the Flotainer® package; new latices for foam goods; improved, high-dispersion black masterbatches; and an American first—synthetic polyisoprene rubber in limited tonnage quantities.

Perhaps information from Shell's modern Technical Service Laboratory can help you solve troublesome technical problems. Write for information on specific polymers . . . or better still, phone us. Our number in Los Angeles is FAculty 1-2340.

SHELL CHEMICAL CORPORATION

SYNTHETIC RUBBER DIVISION, P. O. BOX 216, TORRANCE, CALIFORNIA

SHELL

4

Light-Colored S-1509 is the new low Mooney version of S-1502. S-1509 eliminates breakdown, saving processing time and the cost of peptizing agents. This rubber is ready for immediate use in chemically blown sponge and other applications that demand easy processing and good mold flow.

5

Light-Colored SP-103 is a blend of equal parts of high styrene resin and low Mooney S-1509 rubber in easy-to-handle crumb form. The resin in this masterbatch is already dispersed to save you mixing time and reduce tendency to scorch. The inclusion of S-1509 makes this blend ideally suited for blown sponge.

6

Light-Colored Oil-Extended S-1703 and S-1707 are non-discoloring and non-staining, unusually light in appearance. S-1703 contains 25 parts of light-colored oil in 100 parts of polymer; S-1707 contains 37.5 parts of oil for even greater economy. Both polymers offer cold-rubber properties at low cost.

People Sleep Better

because ZnO is definitely in the picture

Airfoam ™ Mattress Core at Goodyear plant in Akron, Ohio.

Zinc Oxide performs innumerable duties: As a pigment in paint it imparts to the coatings such important properties as tint retention, toughness and durability. As a constituent of glass, glazes and enamels, zinc oxide imparts fluxing power, higher gloss, elasticity and lower expansion with increase in temperature. In the manufacture of rubber products, ZnO assists the cure of compounds based on either natural or synthetic rubber; it contributes reinforcement to many products and — but what's the use of enumerating its manifold functions in this particular field — readers of this publication *know* what they are.

AIRFOAM: ™ The Goodyear Tire & Rubber Company

To the consumer it all boils down to one vital question: Who shall be my number ONE supplier of zinc oxides?

If the ability to provide the precise grade you require—shipment after shipment—is vitally important to you, St. Joe's unique method of high-speed continuous quantitative analysis is your guarantee of consistent grade uniformity. By means of St. Joe's recently installed Baird-Atomic Direct Reading Spectrometer, analysis time has been reduced from the usual 6 to 8 hour interim, *to less than 20 minutes.* This means that once you have selected the specific grade of St. Joe ZnO that meets your requirements, you can set your processing—OUR OXIDE WILL NOT CHANGE.

And, what's all the above got to do with Airfoam ™ Mattresses, made by Goodyear? Well, people sleep better because ZnO is definitely in the picture—and rubber technologists know how to utilize its advantageous properties.

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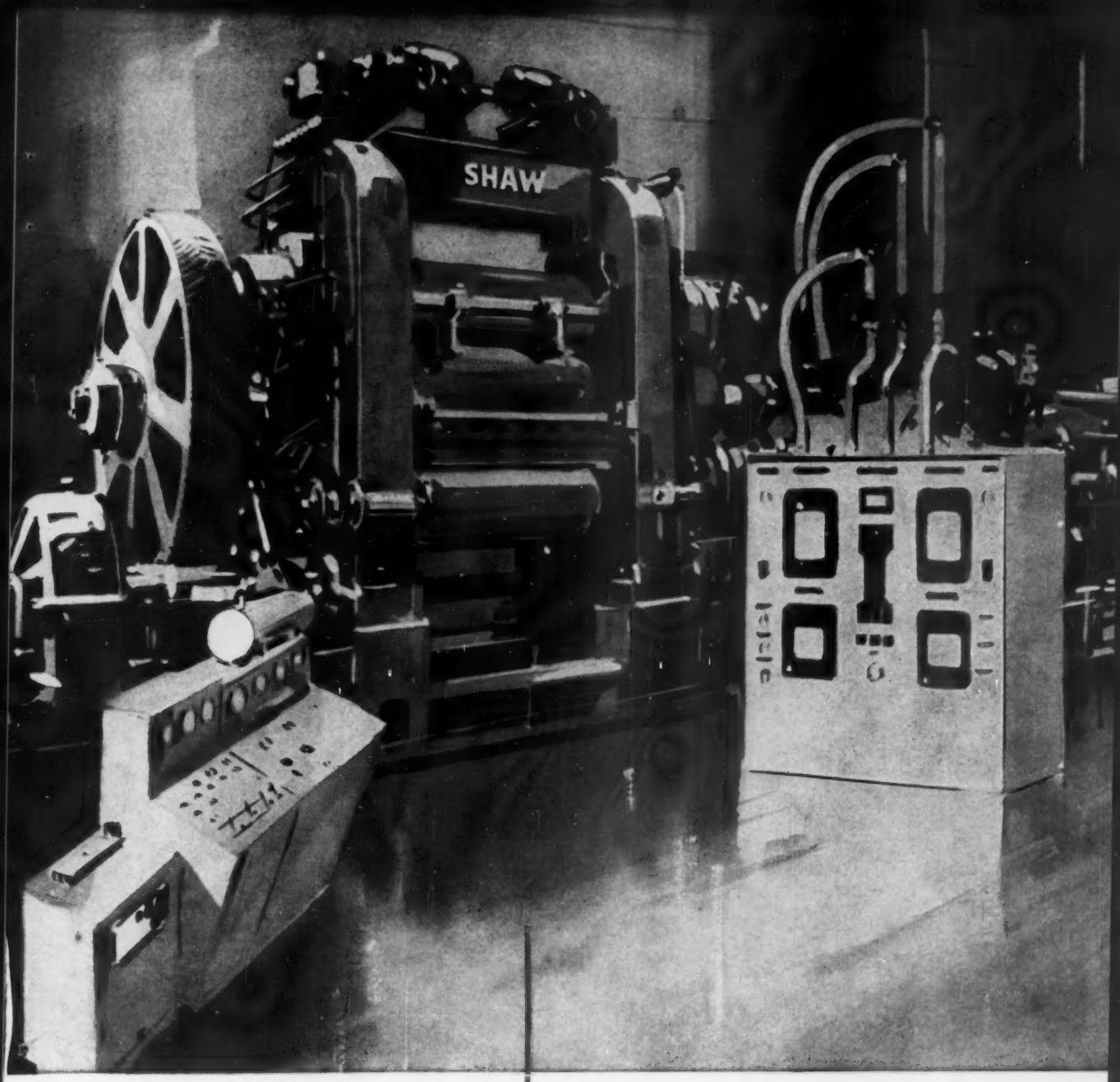

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OVERSEAS AGENTS THROUGHOUT THE WORLD

P 2617

. . . OR DON'T THEY?

These are test samples of freshly made HORSE HEAD zinc oxides being checked for color and texture in one of the plant laboratories at New Jersey Zinc.

Do these samples meet the color and texture standards we have established for our products for the rubber industry? Almost invariably they do, since every step in the development of the properties of HORSE HEAD zinc oxides is carefully checked all along the production line. A highly efficient quality-control system sees to that.

But in the production of zinc oxides at New Jersey Zinc nothing is left to chance, especially with a century-old reputation for the most dependable pigments in the industry at stake. All the properties of all HORSE HEAD zinc oxides are double-checked before a single shipment of pigment is released to a customer. The test shown here is just one of many conducted to make sure, doubly sure, of the highest quality and uniformity standards.

Do your products contain zinc oxides which measure up to the quality and uniformity of the HORSE HEAD line?

HORSE HEAD® ZINC OXIDES

HORSE HEAD PRODUCTS ®

The New Jersey Zinc Company, 160 Front Street, New York 38, N.Y.

No matter where in the world you are
Cabot is your symbol of quality and service

Chances are, wherever in the world you're located, Cabot is not far away.

Here's why: Cabot sells more carbon black in more different currencies throughout the entire world than anyone else—in 58 different countries, on all six continents. Cabot also has more overseas carbon black plants than anyone else, and is constantly increasing production facilities here and abroad.

Wherever you are, and whatever your carbon black needs may be, Cabot is ready to serve you—for the Cabot name is your symbol of quality and service throughout the world.

Delegates to the International Rubber Conference are cordially invited to visit Cabot laboratories and plants in the United States and Canada. Please contact the Foreign Operations Division, Boston Office, for particulars.

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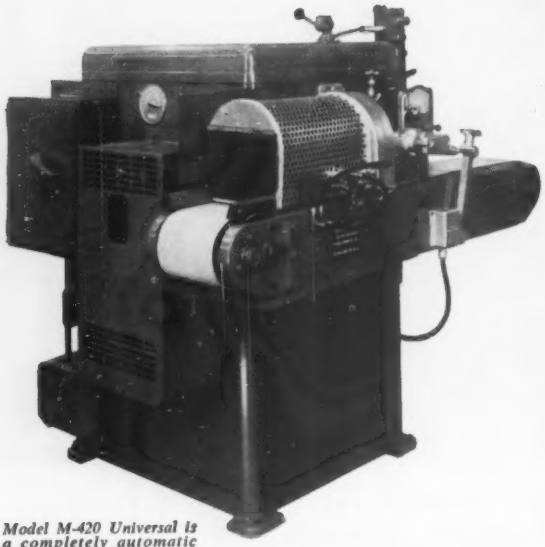
Typical rubber part molded from preps cut automatically by Wink Cutter at Monarch Rubber Co., Hartsville, Ohio.

"Wink Cutter saves us 50 manhours a day."...

Monarch Rubber Company automates cutting of mold preps; eliminates double handling; speeds operations



Model M-420 Universal is a completely automatic machine for both continuous and intermittent cutting. Pays off on short or big runs. The built-in metering conveyor elements transport the uncut stock to the knives, precisely measure the length of cut and move the cut stock away from the blades. Wink actually measures while it cuts from four points simultaneously. It does not depend upon timing or synchronization with another unit or machine—does not cut against a dead element but against another live knife.

New—Large cutter handles up to 6-inch diameters. Write for information.

"The Wink Cutter has really paid off for us in cutting mold preps", reports Monarch Rubber Company, producers of a wide range of molded rubber products. "By automatically cutting mold preps right at the extruder, at rates up to 1500 pieces a minute, we're saving 50 manhours a day." In this operation, the extruded material was formerly cut into long strips, transported to a guillotine cutter, unloaded, and cut at much slower rates.

Accuracy of the Wink Cutter also saves money for Monarch. The Wink unit cuts each piece within a fraction of an ounce. By holding weight of each piece so closely, flashing in the mold is reduced, minimizing waste material. "It's the most accurate machine we've run across", reports Monarch, "and this is important in big production runs."

Wink Cutters *can help you* reduce costs in cutting rubber, both raw and cured, plastics, impregnated fabrics, reinforced hose, natural and synthetic fibers, ceramics, candy . . . even sticky or viscous materials. Write today for Bulletin W-100 . . . it lists complete engineering information. Contact Motch & Merryweather Machinery Company, Wink Cutter Division, 1250 East 222nd Street, Cleveland 17, Ohio.

MOTCH AND MERRYWEATHER

WINK CUTTER DIVISION
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Represented in United Kingdom, Eire, Europe by
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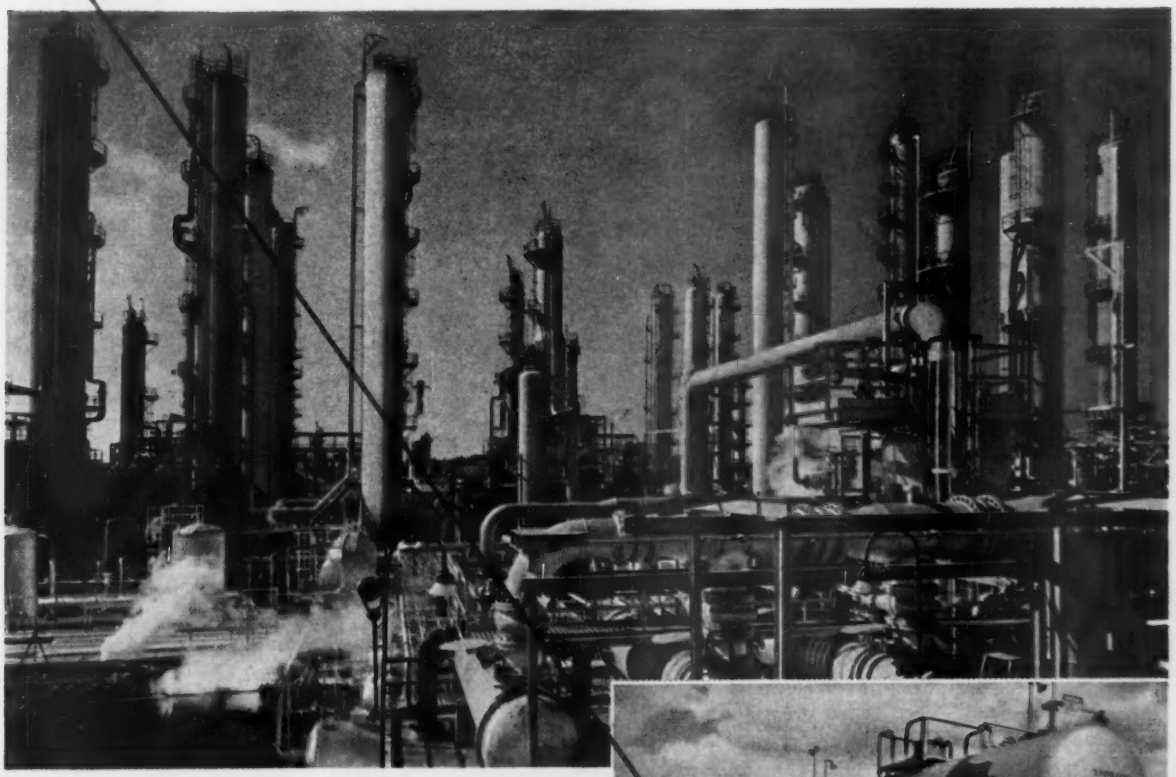
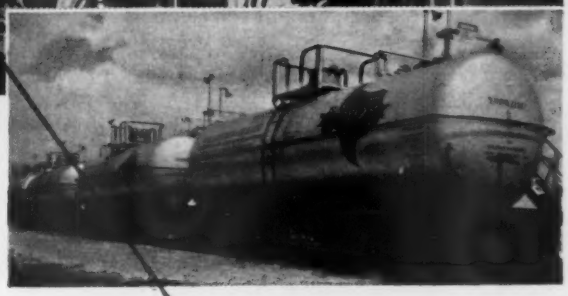
second successful year of substantial commercial output

n-BUTENE-1 (95% minimum)





Anticipating increased interest in copolymers of n-BUTENE-1 and other olefins, Petro-tex came on stream with 95% minimum n-BUTENE-1 a year ago. Now, this high-purity alpha olefin is being used by important producers of linear olefinic polymers to improve resistance to stress cracking and to reduce low-temperature brittleness.

Highly-reactive Petro-tex n-BUTENE-1 also undergoes a wide range of oxidation, hydration, alkalation and oxo-process reactions with interesting petrochemical possibilities.

We invite inquires for technical data, specifications, price and delivery quotations on n-BUTENE-1, as well as . . .

n-BUTENE-2 (95% minimum) **ISOBUTYLENE** (99 + % pure)

BUTADIENE **DIISOBUTYLENE** **TRIISOBUTYLENE**

PETRO-TEX CHEMICAL CORPORATION

HOUSTON 1, TEXAS

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FOOD MACHINERY AND CHEMICAL CORPORATION
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CLOSE TOLERANCES REQUIRE ROYLE "CONSTANT PRESSURE" ROLLER FEED HOPPERS

No. 1 Royle Extruder for Rubber with Roller Feed Hopper.

With a ROYLE "Constant Pressure" Roller Feed Hopper, mechanical rubber goods and insulated wire can be produced to extremely close tolerances.

There are many advantages to using a "Constant Pressure" Roller Feed Hopper:

Closer Diameter Control

Improved Product Density

Increased Production through High Speed and Less Waste

Labor Saving

Royle "Constant Pressure" Roller Feed Hoppers are suitable for all sizes of extruders.

As they have since 1880, Royle is first in Extruder development.

Use this coupon for full information about the NEW Royle "Constant Pressure" Roller Feed Hopper.

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Pioneered the Continuous Extrusion Process in 1880

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Please, send me full information about your "Constant Pressure" Roller Feed Hoppers. Without obligation to me.

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capitol cues

BUSINESS WILL SNAP BACK FAST THIS FALL, aided by renewed steel output. With the mills again operating, economists see nagging doubts disappearing. The stock market will make new gains, industry and consumers will be buying again at a fast clip, and corporate profits will once more be on the increase. The fourth quarter will show gains as large as those during 1959's first half.

The main reasons for the business strength this Fall:

- Inventory accumulation will be rising again, though buying will trail the first half's $10 billion-a-year pace. Tight money will tend to depress the rate at which firms can buy.
- Business investment is rising and will continue to increase. Corporations now have—or can get—much of the money they'll need; but work on offices and shopping centers may slow down.
- Consumer durables will gain in sales, as incomes climb and optimism rises. Interest charges are going up but tighter money won't crimp instalment sales until 1960, if by then.
- Public construction will be expanding, despite tight money. Housing activity won't feel the credit pinch till next year.
- U.S. exports will rise as world-wide business is stepped up.

Here are figures on the size of the upturn economists see:

- Industrial output will rise 6% or 7% to a brand-new record.
- Employment will rise to around 66.5 million during December, 2.5 million over a year ago. Unemployment won't change much.
- Retail sales will be rising 7% to 8% over last year. Autos will set the pace in the fourth quarter with a 40% increase.
- Gross National Product—total output of goods and services—will rise 11% from a year ago and some 2½% from today's rate.

A NEW PROFITS RECORD IS LIKELY THIS YEAR, despite the steel strike. During the first half, profits were running at a yearly rate of $49 billion. In the second half, the rate may drop a bit, though there will be a rebound in the last three months. (The steel strike was a drag during the Summer.) As a result, total 1959 profits may come to only around $48 to $49 billion.

Such a showing, even though it is a bit below early guesses, will still be very good. Previous peak for corporate profits was the $45 billion total in 1955. A good comeback this Fall raises the possibility of more gains in profits during 1960.

MORE FIRMS WILL BE ASKING FOR GOVERNMENT LOANS this Fall—that's the expectation of U.S. officials. Tight money will force hard-pressed outfits to go to the Small Business Administration and SBA-authorized Small Business Investment Companies. From SBA, loans can be obtained at better than going-market rates of 5½%. Private lenders participating can charge up to 6½%.

From the SBIC's, there is around $13.5 million available at 30 chartered "banks." But interest rates are much higher—10% to 15%—since loans are backed only by borrowers' bonds.

capitol cues (cont'd)

THERE'S LITTLE CHANCE OF A TAX CUT IN 1960—that's the word now from the Treasury and leaders of Congress. In the current fiscal year, there won't be much of a Budget surplus, if any. And in the coming fiscal year, the prospect is for no more than a surplus of $1 billion or so. That won't be enough to permit relief for individuals. Anyway, if business stays good, Congress won't be under pressure to cut, though 1960 is an election year.

However, if there should be a downturn—or even a leveling—in the trend of business, you can look for a big campaign by the Democrats for tax relief. But the Administration can be expected to try to put off any reductions for individuals.

THE PENTAGON WILL BUY FEWER DEFENSE ITEMS next year, according to key Budget officials. The military budget now under preparation will call for spending of $41 billion, the same as for the current year. But higher costs in the coming year will mean that the total won't stretch as far as planned. Some projects will be cut out entirely, while others will be trimmed sharply. The number of men in uniform will be reduced, with the big money concentrated on a few important missiles such as the Atlas, Minuteman, and the Polaris.

WHEN CAN YOU BE TAXED ON YOUR INTERSTATE BUSINESS by other states? As you may have read, Congress before quitting voted a law designed to clear this up. You need not pay state taxes hereafter if you only solicit through salesmen whose orders are approved and sent in from out of state, or if your orders are handled through independent contractors. But you may have to pay state taxes if you maintain a warehouse, a sales office, or a stock of goods.

FREIGHT COSTS WILL BE LOWERED ON MANY COMMODITIES in the months ahead. The Interstate Commerce Commission has just formulated a new policy on rates. ICC will hereafter let carriers cut tariffs even if their competitors suffer. So, the railroads will now start cutting charges on long lists of commodities in an effort to regain traffic they have previously lost to trucks and barges.

This Fall, shippers will be hampered by freight-car shortages. Need for the cars will climb in the wake of the steel strike. Cars even now are in short supply and will get much scarcer.

GROUP MEDICAL INSURANCE COSTS WILL SPURT AGAIN during the next year or so—a fact of considerable importance to employers who help to pay for this fringe benefit. There are two reasons for this trend: Hospital fees and drug prices are going up; and folks are using these benefits more and more. How much will charges rise? 6-8%, as against a 5% average in recent years.

A NEW DRIVE TO BOOST U.S. EXPORTS is quietly being launched by the government in Washington. Efforts are centering in talks with officials of more than a dozen countries—those which have benefited most from economic aid since the war. The action comes at this time because their recoveries are now complete. In fact, most have favorable trade balances with the U.S.

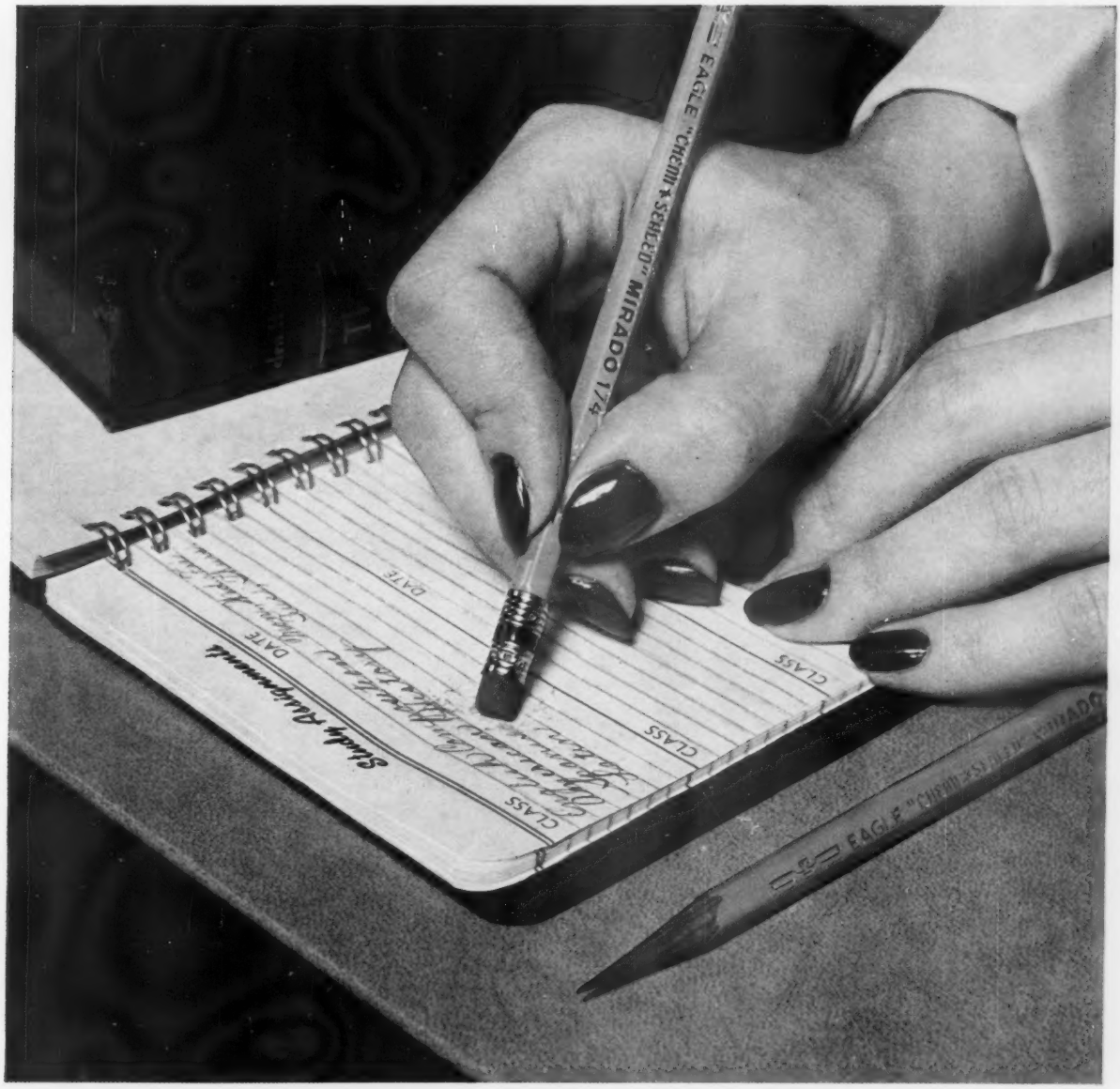
American officials are plugging for two main things:

- Reductions in quotas on the importation of U.S. goods—or even their elimination. Foreign economies can stand this.
- Stepped-up spending of U.S. aid dollars in this country. Right now, recipients are free to buy where they please.

Mistakes come clean with Ameripol Rubber

When you up-end your Eagle pencil you'll find that erasing is quick and clean . . . no marring or tearing the paper. A detail? Yes—and a mighty important one for a quality-conscious manufacturer. That is why Eagle Pencil Company uses Ameripol rubber for erasers. The polymer selected is noted for its clarity and uniformity. It is non-staining—won't leave marks on paper. Its properties permit easy processing in pastel colors—just right for erasers and other light-colored products. You'll find it pays to check Goodrich-Gulf for your rubber requirements. We offer a broad range of polymers to make your processing easier and less costly. Our improvements in packaging cut handling costs; our nearby facilities speed delivery to you. For further information on Ameripol . . . *the preferred rubber* . . . contact Goodrich-Gulf Chemicals, Inc., 3121 Euclid Avenue, Cleveland 15, Ohio.

Ameripol
THE PREFERRED RUBBER



Goodrich-Gulf Chemicals, Inc.

extrusions

Here are a few of the thousands of extrusions made by Pawling Rubber Corporation.

Pawling Rubber reports:

"Faster, cleaner, smoother extrusions with AMERIPOL MICRO-BLACK masterbatch"

Pawling Rubber Corporation, Pawling, New York, turns out thousands upon thousands of stock and custom precision extrusions—in rubber, plastic and silicone—for the appliance, aviation, automotive, electronics and construction industries.

For a large portion of their synthetic rubber extrusions, Pawling uses Ameripol Micro-Black—the new, high-dispersion SBR masterbatch produced by an exclusive high liquid shear agitation process.

Since the carbon black is already integral in Micro-Black—and more thoroughly dispersed than in any conventional dry mix—Pawling gets these advantages by using Ameripol Micro-Black.

Extrusions are much faster and smoother, because of the superior dispersion of carbon black in Micro-Black.

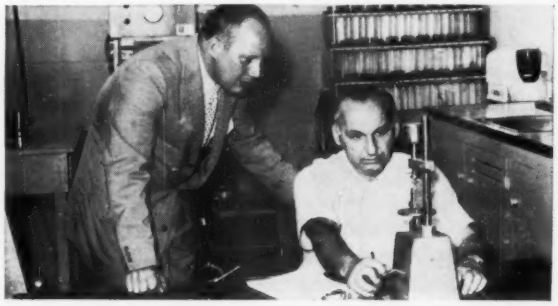
Finished products have superior physical properties—greater tensile strength, greater stress resistance.

Pawling saves space by eliminating the storage of loose black, as well as the problems of weighing and mixing it.

Micro-Black gives them a cleaner, more efficient operation. No messy black to handle or clean up.

They save the time of 4 sweep-down cycles for black incorporation. This time-consuming operation is not required at all with Ameripol Micro-Black.

See how you can speed up production, improve your product and cut costs with new Ameripol Micro-Black. For complete information on the properties and applications of all 11 types of this high-dispersion masterbatch, write for new illustrated Micro-Black data book.



B. U. Adamson, Goodrich-Gulf Sales Engineer (left) watches M. A. Bedics, Chief Engineer of Pawling Rubber Corporation, make hardness test on a stock that includes Micro-Black masterbatch.

Goodrich-Gulf Chemicals, Inc.

3121 Euclid Avenue, Cleveland 15, Ohio

• Indian newspapers report that eleven millionaires in Indonesia and Singapore have jointly set up a multi-million-dollar syndicate in Kuala Lumpur to take over the European-owned estates which are offered for sale in the Federation of Malaya. This is believed to be the biggest Asian capital investment in the Federation since that country became independent. The venture is described by commercial circles as a move against the fragmentation and subdivision of estates. The subscribed capital of the syndicate is more than $200 million, with provisions to float another $200 million on three months notice. Promoters consider this venture a long-term capital investment which is quite safe in the Federation.

• The Italian concern, Pirelli, is about to build a factory in Turkey which will have an initial capacity of 120,000 tires a year, to be increased later to 250,000 units. The factory will go on stream in 1960.

• The Natural Rubber Development Board of Malaya has issued a report dealing with various facets of the natural rubber industry. The Malayan Minister for Commerce and Industry, who introduced the Malayan Rubber Fund Research and Development Bill, pointed out in a discussion on the challenge of synthetic rubber, that the vigorous replanting program is one answer to that challenge. Reorganization and intensification of research is another and equally important answer. In short, natural rubber must outperform synthetic rubber regarding price and quality.

The Board has done much to develop the use of rubber, particularly latex foam, in the furniture industry. It was pointed out that the use of rubber in one form or another in furniture represents an outlet for natural rubber second in potential importance to only the pneumatic tire. In 1958, total world consumption of natural rubber latex amounted to about 165,000 tons. Of that total, more than 70,000 tons were shipped to the United States. Although elastics find their applications in various industries for such purposes as dipped goods, elastic thread, adhesives, impregnation of tire cords and latex-cement floorings, by far the greatest proportion is utilized in foam for upholstery purposes. The market for latex foam is steadily expanding.

• The Technical Cooperation Mission (TCM) of the United States government has offered to help India's rubber industry to send abroad productivity teams sponsored by the National Productivity Council of India. Cost of international travel and expenditure incurred in the countries visited by the teams will be borne by the TCM. One team, consisting of employers' representatives, technicians and workers, was sent by the NPC to the United States, England and West Germany in 1958 for a study of productivity techniques in the rubber industry. A team of representatives from the plastics industry is at present touring Italy, the United States and Japan.

• The German Ferrostahl group has submitted an offer to finance the cost of machinery and construction of a synthetic rubber plant in Pernambuco, Peru.

• According to current reports, a British Trade Fair may be opened in Moscow on June 9, 1961. The Fair, which will last for just over two weeks, will be housed in Sokolniki Park in Moscow.

• The L'Akhali and Chemical Corp. of India, Ltd., a subsidiary of I. C. I., has almost completed the construction of a factory for the production of polyethylene, having a yearly capacity of 3,500 tons. The new factory is located in Rishra, near Calcutta. Another development in India involves the Indian subsidiary of Union Carbide, which is constructing a factory for the production of polyethylene at Trombay not far from Bombay. The unit is expected to go on stream in 1960.

• Rubber growing has been extended in the Dominican Republic and initiation of a full scale effort to launch a rubber industry has been announced after the success of a pilot rubber plantation scheme conducted by the Dominican Republic Department of Agriculture since 1952 in the Saman province. Plans include the planting of 67,000 trees in some of the areas having the heaviest rainfall.

The most modern methods are to be used with a double crop system in operation. The latest figure for production of the pilot scheme is six tons of latex from 1200 trees. At present, rubber outlets in the Dominican Republic consist of several tire retreading plants, but with the long-term expansion of rubber growing, it is hoped that Dominican and overseas firms will develop factories which use rubber in the country.

On the Continent (cont'd)

• The Indian trade press emphasizes that the demand for natural rubber last year exceeded supply. United States consumption of natural rubber was 35.7 per cent of the total consumption, and the combined consumption of Russia, Eastern Europe and China amounted to no less than 31.6 per cent. It is emphasized that the purchases of the countries behind the Iron Curtain have approximated the amount consumed by the United States, a startling change in the general pattern of demand.

• The Greek government has consented to a plan, submitted by the Dow Chemical Co., to build a plant for the manufacture of polystyrene plastics in Greece. The unit will be built at a location to be determined, with construction scheduled to begin soon. The facility which is expected to cost $1 million will utilize imported raw materials and will be the first to produce polystyrene in Greece. Operations will start in early 1961.

• Philips Co. and Koppers Co. are planning to build a factory for the manufacture of synthetic rubber in Recife, the capital of the Brazilian state of Pernambuco. The factory will produce about 4,000 tons of synthetic rubber a year. Cost of the new unit will amount to about $8 million.

• West German production of tires of all kinds amounted to 128,116 tons for the period from January 1 to August 30 of this year. Last year, only 102,124 tons were produced. Included in this year's figures were 9.26 tires for bicycles and 7,570,000 tires for cars. Last year, only 8.2 million bicycle tires and 5.5 million car tires were shipped. Truck tires amounted to 1.01 million units this year, while last year only 720,000 truck tires were produced. The Saar and the territory of West Berlin have not been included in these figures.

• The Indian Trade Press has reprinted a leading article from *The British Trade Journal and Export World,* entitled "Revaluation of the Dollar." Here are a few paragraphs from that article: "The plain fact is that so far as many manufactured goods are concerned, the United States has priced itself out of world markets. Its exports have declined by 26 per cent from peak levels, its prices have risen far more sharply than British or German prices, and a recent survey showed that the wages of U. S. Steel workers are three times as high as those of their British counterparts. In the first seven months of 1958, the United States exported goods to the value of $3,133,000 to Western Europe, as against $4,215,000 in the same period of 1957.

"Similarly, exports to Latin America for 1958 amounted to $4,000,000 against $4,673,000 in 1957. It is a significant fact that even in some cases where the United States is willing to give loans or grants to foreign countries, there is reluctance to buy American capital equipment because the costs are so much higher than similar equipment in Western Europe.

"All these factors add up to sound financial reasons why a currency should be devalued so that it is in line with the international assessment of its value and so that the costs are made comparable. Were it any currency but the dollar, a revaluation would seem inevitable.

"This extreme step may be taken only if the U. S. Government is forced to do so in the interest of American exporting industries, and it is this aspect which many people find most puzzling in the present situation. American industry has taken the fall in its exports with remarkable calm and, so far as can be judged, without any unusual demands for government action. Why?

"The view has been advanced that U. S. industry is already reconciled to this loss of overseas markets and has already made its plans for meeting the situation. According to this view, the phenomenal expansion of American overseas investment in recent years is due to recognition that United States firms can produce more cheaply in other countries.

"One American research organization has estimated that when the European Common Market is in full operation, the loss of United States exports to these countries will range from 30 per cent, for some industries, to 80 per cent. By that time four out of five American corporations now shipping abroad will be manufacturing in Western Europe or will have entered into licensing arrangements.

"Experience in the United Kingdom in recent years would tend to confirm this assessment. Nearly every week brings news of new American developments here in Britain or of some new tie-up with a British manufacturer. All this is good for British industry since it enables the latter to make use of the latest techniques and to take advantage of American Capital."

Small wonder that Americans are shocked when they make a trip to Canada and find out that Canadians don't want to accept the dollar at par. It looks as though the export department of every major company will become one of the most important facets of our industry. After all, we'll have to close a trade gap of almost $4 billion. If we don't get busy very soon, we are going to lose much more and it is possible that the dollar will really have to be devaluated.

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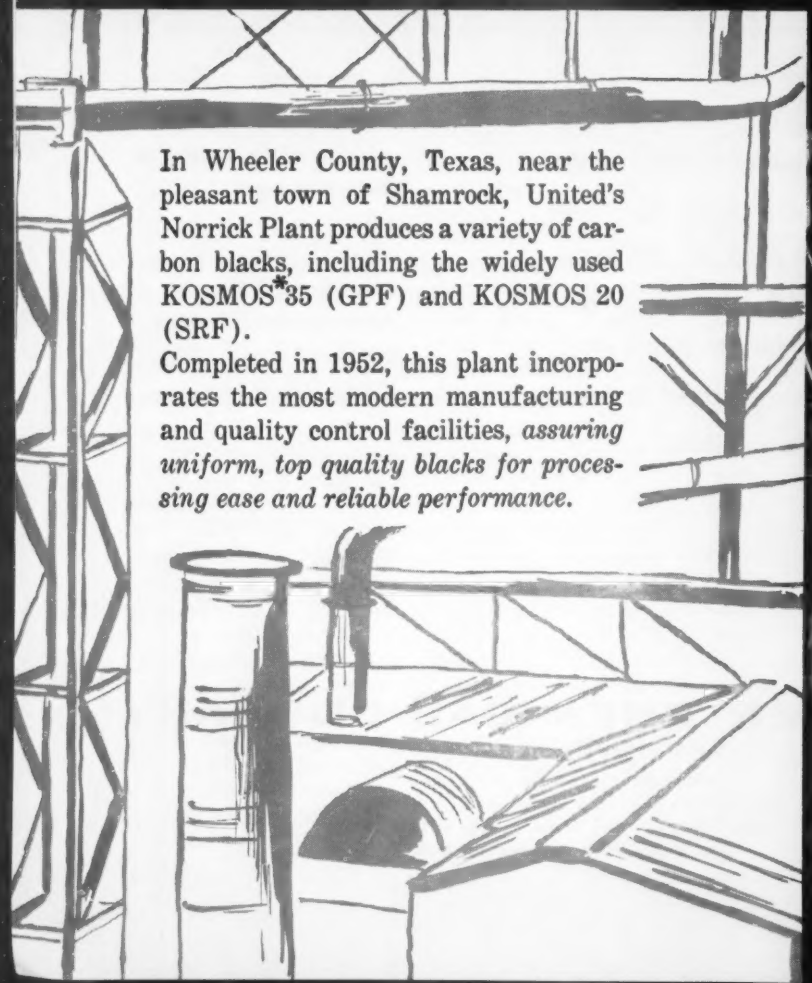

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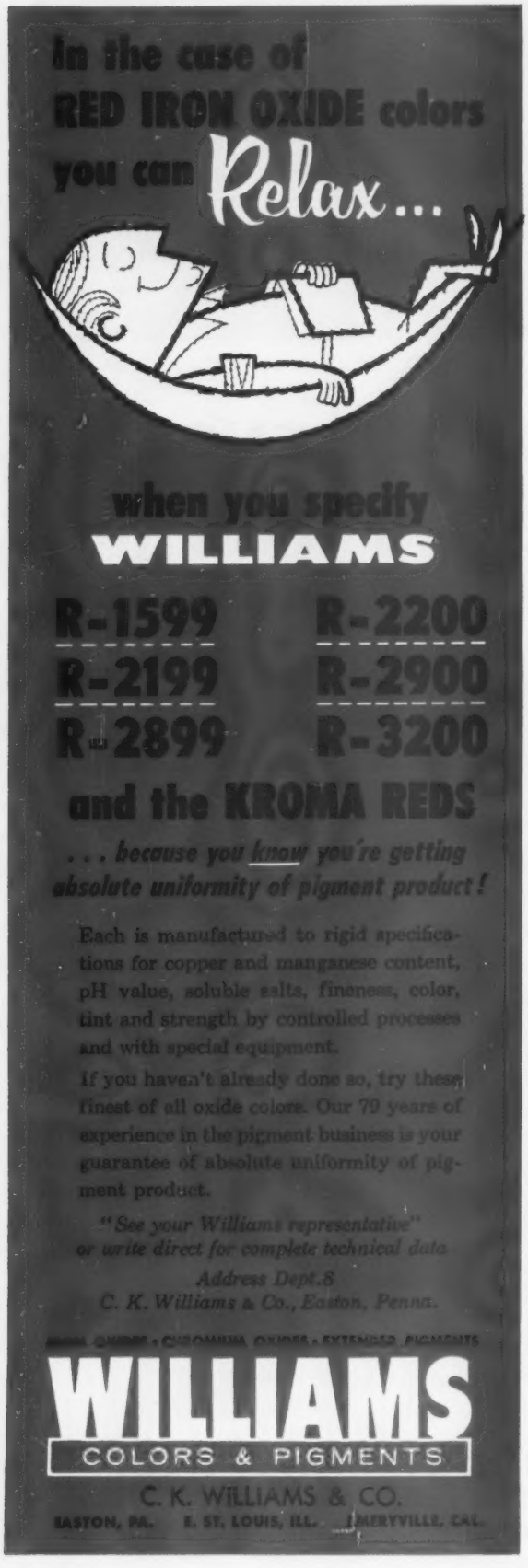
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Overseas

Canberra—Australian Synthetic Rubber Co., Ltd., has awarded a contract to Fluor International, S. A., which will serve as prime contractor for the construction of Australia's first synthetic rubber plant. The unit, which will be located at Altona near Melbourne, will have a capacity of 30,000 tons of synthetic rubber annually. Production will begin in 1961.

Paris—Societe de Procedes Fit of Grenoble has been licensed by Pawling Rubber Corp. to produce appliance, construction and household products for the European Common Market. The agreement follows extensive negotiations between the firms that included an exchange of top management and technical personnel.

The Hague—B. F. Goodrich Co. has opened Holland's first synthetic plant, which is located on a 10 acre site on the Rhine River, a major lifeline in what is known as the Euromart. Goodrich, the leading shareholder, has Dutch associates in the venture.

Bonn—Latex Corp. of Dover, Del., is producing Playtex undergarments at a plant operated by Internationale Latex G. m. b. H. in Alzey on the Rhine. The factory, which initially is being supplied with semi-finished products from a Scottish plant, is intended to service the Common Market area. Capital of the German firm is held by a Swiss holding company owned by the Delaware Corporation.

Rio de Janeiro—Goodyear Tire & Rubber Co. is investing 2,500,000,000 Brazilian cruzeiros in the expansion of its Sao Paulo installation. The enlarged plant will have a capacity which is 30 per cent greater, turning out three thousand units daily.

Paris—Firestone Tire and Rubber Co. plans to establish a multi-million dollar manufacturing operation in France. In addition to a tire factory, the company plans to build a plant for the manufacture of special synthetic latices and copolymers of butadiene and styrene. Location for the facility will be chosen in the near future with construction slated to begin immediately afterwards.

Madrid—Firestone Hispania has borrowed $650,000 from the National City Bank of Cleveland and the Mellon National Bank and Trust Co. in Pittsburgh in order to expand truck tire production. The Spanish firm will buy new equipment and machinery from Firestone Tire & Rubber Co. in Akron, with which it is affiliated.

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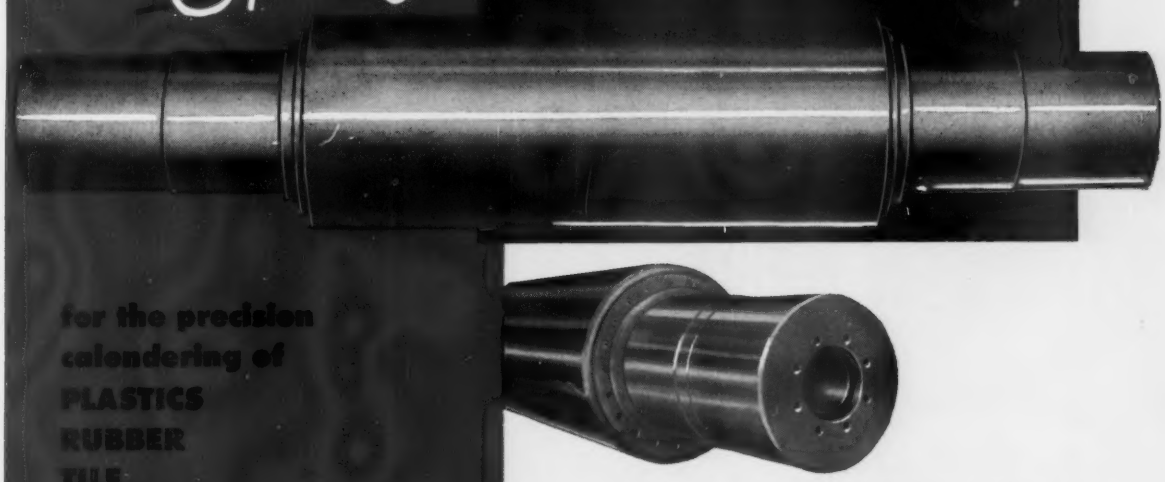

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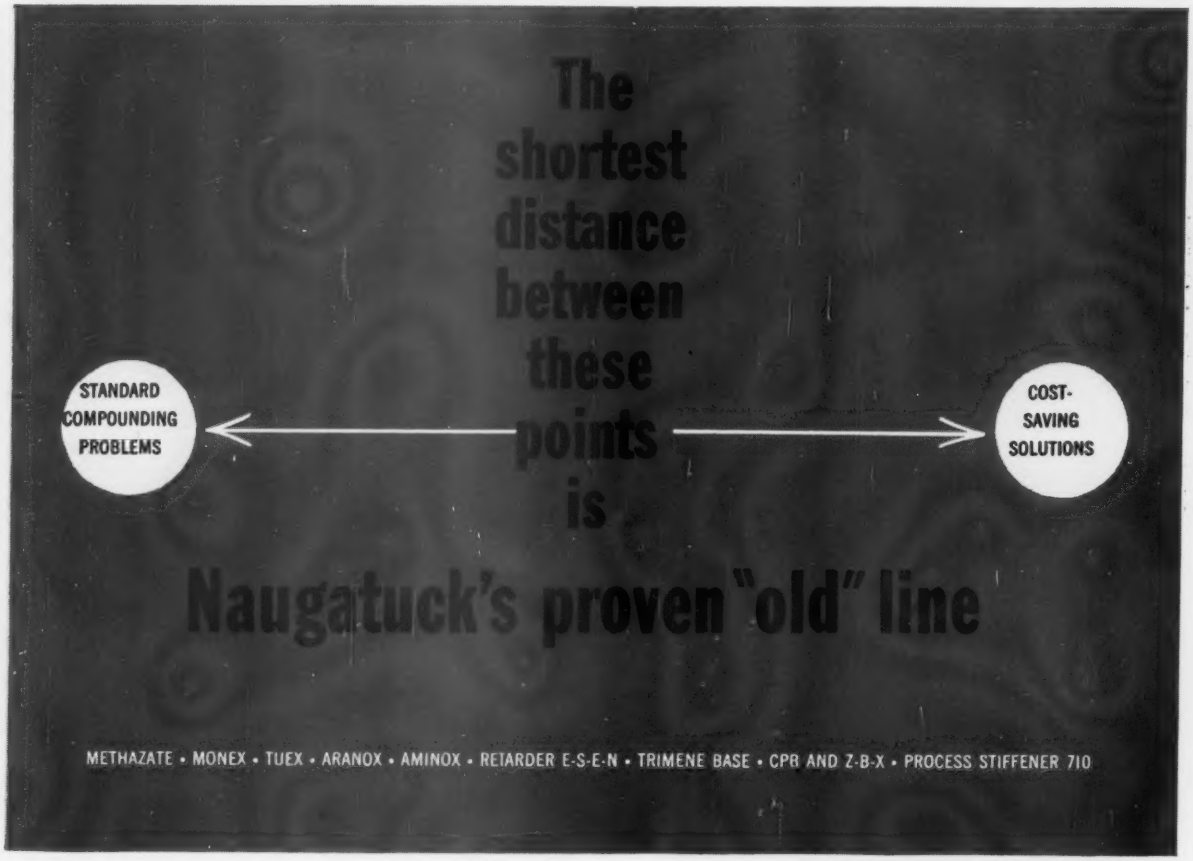
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RUBBER AGE
Vol. 86, No. 2/November, 1959

Radiation Vulcanization of Elastomers

Atomic accelerators and reactors promise high temperature stress-strain properties

By DALE J. HARMON

Research Center,
B. F. Goodrich Co.,
Brecksville, Ohio

WITHOUT either the discovery of an accelerator to reduce the total exposure to about 3 Mr or the development of lower cost electron accelerators, it appears that radiation vulcanization will not be competitive costwise within the next ten years. However, it should be kept in mind that besides the savings possible from the elimination of many compounding ingredients, appreciable savings may be introduced due to the elimination of such items as curing pits, molds, and curing ovens. The engineer will also be free to revise his production line in order to capitalize on the high speed, continuous flow advantages of radiation cure.

When all such possibilities are carefully considered, there may be specific applications where this method of vulcanization might now be used, particularly in the case of extruded items. Therefore, physical properties of radiation vulcanizates were studied, such as high temperature resistance, ozone cracking, and oxidation rate, and the results compared with similar measurements on chemical vulcanizates.

Sample Preparation

The compounds prepared for comparison with the radiation cures were known to have good age resistance (Tables I and II). Except for those recipes used for studying the effect of adding age resister, the recipes for radiation vulcanization consisted only of the polymer and the same amount and type of reinforcing agent as employed in the corresponding chemical cure.

A record of mill mixing times and stock temperature was kept. The radiation stocks were mixed using the same number of mill roll passes and maintaining the same temperature as for the corresponding chemical stocks. A cure study was then made of the chemical stocks and optimum cure chosen on the basis of the best balance of tensile strength, ultimate elongation and 100% modulus.

Since the purpose of the study was to compare radiation cures with chemical cures, it was decided the best criterion for comparison was equivalent M_c (apparent average molecular weight between cross-links). The samples for radiation vulcanization were molded 10 minutes at 212°F. in the case of tensile sheets, and 15 minutes at 212°F. in the case of abrasion buttons, hysteresis pellets, and Yerzley pellets. A cure study was made, with radiation exposure as the variable, and the exposures for optimum cure as well as the exposures required to give the same M_c as the optimum cure of the corresponding chemical cures were determined. Typical cure curves for two of the eight elastomers studied are shown in Figures 1 through 2 and the doses for optimum cure along with the stress-strain values in Table III.

Optimum stress-strain values were obtained at exposures ranging from 10^7 to 5×10^7 rep. Two different gamma facilities were utilized. One was the B. F. Goodrich Cobalt-60 gamma source *(1)* which had a flux of 0.15 Mr/hr and the other was the Material Testing gamma facility at the Reactor Test Station, Arco, Idaho, which had a flux of from 1 to 9 Mr/hr depending on the age of the reactor fuel elements employed. Tests in this and other laboratories have shown that for hydrocarbon polymeric materials the difference in flux over the range employed is insignificant *(12)*.

Irradiation

Samples irradiated in vacuum were placed in glass tubes and evacuated to 5×10^{-6} mm Hg and then sealed. High speed electron irradiations were made

using a 2 Mev Van de Graaff generator at the High Voltage Engineering Corp., Burlington, Massachusetts. The electron vulcanized samples were irradiated on a bed of dry ice to prevent temperature build up.

The action of radiation on rubber is not completely understood though several postulated mechanisms have been offered *(13, 20)*. Charlesby *(3)* found that the degree of cross-linking, in the case of natural rubber, is directly proportional to the radiation dose over a wide range of values and occurs at random. The mathematical relationship found is $M_c = 6 \times 10^3/R$ where M_c = average molecular weight between cross-links and R = number of units of radiation (1 unit = 10^{17} slow neutrons per cm^2).

Charlesby also points out that "qualitatively" the effects from various types of high-energy radiation should be similar since only a small portion of the molecules is affected by the primary radiation. The postulated mechanisms may be summarized as follows.

When high energy radiation passes through organic molecules there may result the formation of displaced atoms, ions, free electrons, and excited molecules. The end results are chemical reactions, most of which appear to be due to the presence of free radicals.

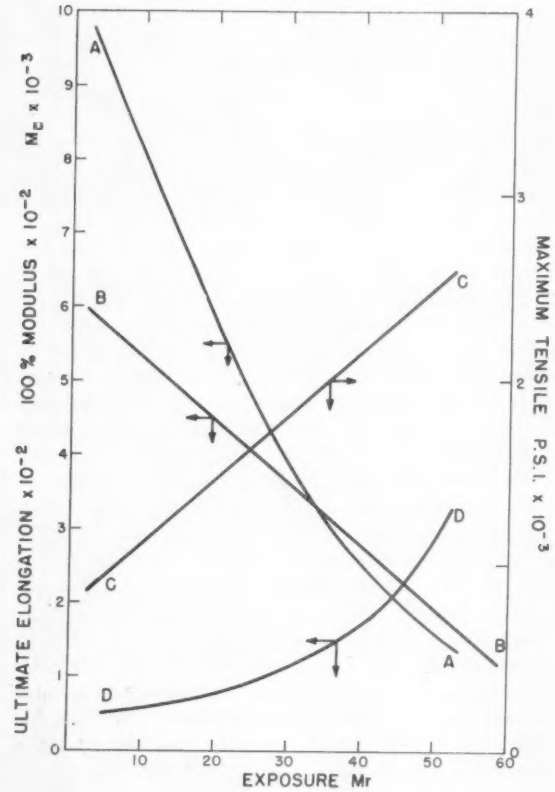
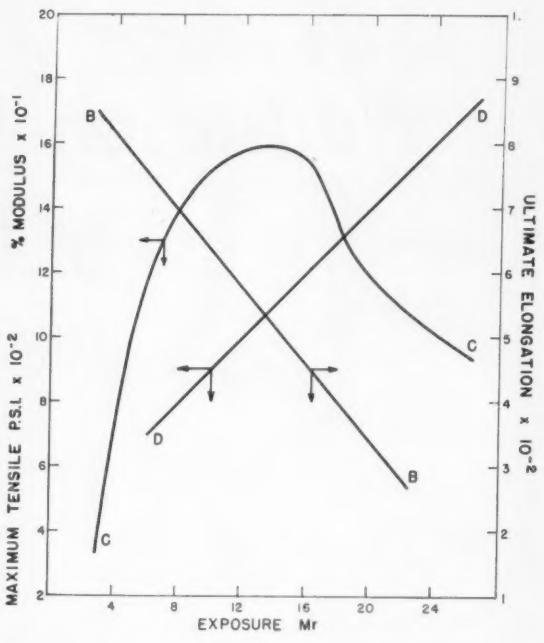


FIG. 1—Cure curves of cold styrene rubber with 48.7 phr ISAF black.

(A=Mc, B=ultimate elongation, C=maximum tensile, D=100% modulus).

FIG. 2—Cure curves of Viton A with 20 phr MT black.

(B=ultimate elongation, C=maximum tensile, D=100% modulus).



The processes by which the original excited forms are degraded into free radicals are not clearly understood. The end result appears to be a combination of chain scission and cross-linking.

In polymers containing tertiary carbons, scission predominates. This is the case for polyisobutylene. In polymers containing alpha hydrogens or hydrogens on primary or secondary carbons as for polyisoprene, cross-linking predominates. The ratio of scission to cross-linking in a given elastomer can be altered by irradiating the material in an oxygen-free atmosphere. The amount of scission occurring is then decreased, indicating that the scission is at least partially by an oxidative mechanism.

Testing Program

The chemical vulcanizates and radiation vulcanizates were subjected to a test program which consisted of stress strain at room temperature and elevated temperature, 100% modulus, abrasion resistance, dynamic modulus, resilience, hysteresis, permanent set, hardness, freeze point, oxidation rate, ozone cracking, elevated temperature test tube aging, apparent average molecular weight between cross-links (M_c), and solvent resistance.

All stress-strain testing was carried out on the Standard Scott Tester according to ASTM, D-412. One hundred per cent modulus measurements were made by elongating the sample (¼ x 2 1/3 x 0.025-inch) 100% and measuring the stress after an elapsed time of 1 minute. Abrasion measurements were made

Table I—Compound Recipes

Chemical Cure	1CFB32	1CFB33	1CFB34	1CFB35	1CFB36	1CFB37
Radiation Cure	81RGA7	81RGA6	81RGA1	81RGA8	81RGA4	81RGA2
Neoprene-W	100.0	—	—	—	—	—
Neoprene-GN	—	100.00	—	—	—	—
Natural rubber	—	—	100.0	—	—	100
Styrene rubber (hot)	—	—	—	100.00	—	—
Acrylonitrile-butadiene rubber	—	—	—	—	100	—
Stearic acid	0.5	0.50	—	—	—	4
Zinc oxide	5.0	10.00	5.0	5.00	5	5
Magnesia	2.0	4.00	—	—	—	—
NA-22	0.5	0.25	—	—	—	—
Goodrite AO-3100	2.0	—	1.0	—	—	1
Akroflex C	—	1.00	—	—	—	—
Aranox	—	1.00	—	—	—	—
TMTD	—	—	3.5	—	4	—
MBTS	—	—	—	1.75	—	—
Sulfur	—	—	—	1.75	—	—
Dicumyl peroxide	—	—	—	—	—	2
HAF black	40.0	—	—	—	—	—
EPC black	—	40.00	—	—	50	50
SRF black	—	—	80.0	65.00	—	—
Total parts	150.0	156.75	189.5	173.5	159	162
Specific gravity	1.40	1.45	1.23	1.19	1.21	1.13
Optimum cure						
Min.	40	30	50	90	40	35
° F.	300	300	280	300	300	300

Chemical Cure	1CFB38	1CFB39	1CFB30	81RHA8	81RGA24	81RGA25
Radiation Cure	81RGA3	81RGA5	1CFB31	81RHA1	81RHA4	81RHA5
Styrene rubber (cold)	100.00	100.00	—	—	—	—
Acrylonitrile-butadiene rubber	—	100.00	—	—	—	—
Kel-F 3700	—	—	100	—	—	—
Viton A	—	—	—	100.0	—	—
Poly FBA	—	—	—	—	100	—
Poly FMFPA	—	—	—	—	—	100
Stearic acid	1.00	1.00	—	—	—	—
Soft asphalt	12.25	—	—	—	—	—
Zinc oxide	4.00	5.00	10	10.0	—	—
Agerite stalite	0.30	—	—	—	—	—
Goodrite AO-3152	0.30	—	—	—	—	—
Lead maleate	—	—	10	—	—	—
Dyphos	—	—	—	10.0	—	—
Dicumyl peroxide	2.00	1.25	—	—	—	—
Benzoyl peroxide	—	—	3	—	—	—
Diak No. 1	—	—	—	1.3	—	—
Triethylene tetramine	—	—	—	—	1	1
Sulfur	—	—	—	—	1	1
Hi-Sil X303	—	—	40	—	—	—
ISAF black	48.7	—	—	—	—	—
FEF black	—	40.00	—	—	—	—
MT black	—	—	—	20	—	—
HAF black	—	—	—	—	35	35
Total parts	168.55	147.25	163	141.3	137	137
Specific gravity	1.17	1.15	2.05	2.03	1.66	1.66
Optimum cure						
Min.	**30**	**20**	**30**	**30**	30	30
° F.	300	310	230[a]	275[b]	310[c]	310[c]

(a) Oven aged 16 hr. at 300°F.; (b) oven aged 24 hr. at 400°F.; (c) oven aged 24 hr. at 300°F.

on a Pico Abrader *(17)* using an EPC black reinforced natural rubber sulfur vulcanizate as the standard. Temperature rise and set were measured with the B. F. Goodrich Flexometer according to ASTM, D-623. Dynamic modulus and resilience at 20% deformation were measured on the Yerzley Mechanical Oscillograph at 212°F. according to ASTM D-945. Hardness was measured using a Shore A Durometer according to ASTM, D-676, with the sample thickness 0.5 inches. The freezing points were measured using a Gehman Torsional apparatus according to ASTM, D-1053.

Solvent resistance was measured by volume swell measurements according to ASTM, D-471. Samples were immersed 70 hours at 25°C. in the case of acetone, benzene, water, hexane, and carbon tetrachloride and 70 hours at 177°C. in the case of ASTM oils number 1 and 3.

Ozone cracking measurements were carried out in a laboratory ozone test chamber at 120°F. Two separate runs were made during which the measured ozone concentrations were 53 and 56 pphm, respectively. The induction period measured was the time to form cracks that were visible at 30X magnification. This test is similar to and at least the equivalent of ASTM, D-1149.

TABLE II—DESCRIPTION OF POLYMERS AND COMPOUNDING MATERIALS

Material	Description
Natural rubber	A blend of No. 1 ribbed smoked sheet and No. 1 thin pale crepe.
Styrene rubber (hot)	1001, F. A. Type, 122°F. styrene-butadiene copolymer.
Styrene rubber (cold)	1500/1501 R.A. Type, 41°F. styrene-butadiene copolymer.
Acrylonitrile-butadiene rubber	Medium acrylo content butadiene-acrylonitrile copolymer.
Neoprene-GN	A sulfur modified polychloroprene stabilized by a thiuram disulfide.
Neoprene-W	A stabilized polychloroprene containing no sulfur or other compounds capable of decomposing to liberate sulfur or act as an accelerator.
Viton A	A copolymer of vinylidene fluoride and perfluoropropylene.
Poly FBA	Poly 1, 1-dihydroperfluorobutyl acrylate.
Poly FMFPA	Poly 3-perfluoromethoxy 1, 1 dihydroperfluoropropyl acrylate.
Kel-F 3700	A copolymer of trifluorochloroethylene and vinylidene fluoride.
Na-22	2-Mercaptoimidazoline.
Goodrite AO-3100	Phenyl-β-naphthylamine.
Akroflex C	35% N, N′-diphenyl-p-phenylenediamine. 65% Phenyl-α-naphthylamine.
Aranox	p-(p-tolyl-sulfonylamido)-diphenylamine.
TMTD	Tetramethyl thiuram disulfide.
MBTS	Benzothiazyl disulfide.
Agerite Stalite	Heptylated diphenylamine.
Goodrite AO-3152	Diphenyl-p-phenylene diamine.
Dyphos	Dibasic lead phosphite.
Diak No. 1	Hexamethylenediamine carbamate.
Hi-Sil X303	Silica reinforcing agent.

All oxidation rate measurements were made in an apparatus designed to measure volume of oxygen consumed at constant pressure and temperature. This apparatus is similar to that described by Tobolsky *(21)* and Shelton *(18)*. The pressure was 760 mm ± 15 mm of mercury. The temperature was 120 ± 0.1°C. Water and carbon dioxide evolved during the oxidation were absorbed by Ascarite and Dri-rite. Similar measurements on the same equipment have been described by Veith *(22)*.

In the study of the effect of antioxidant on the radiation cured materials, the choice of antioxidant was made by referring to the study of J. W. Born *(2)* on the antirad action of various organic compounds including a large number of antioxidants. It was desirable to obtain a material with little or no antirad action (radiation damage protection), yet which was a good antioxidant. PBNA (phenyl-beta-napthylamine) came nearest to meeting the qualifications. The effect of the PBNA on the original stress-strain properties at optimum cure as well as the protection of stress-strain properties at elevated temperatures was examined.

To study the elevated temperature properties of the vulcanizates, ASTM dumbbells were testtube aged 16 hours at 212°F. and 300°F. according to ASTM, D-865. Control and aged samples were then pulled at 77°, 212° and 300° F. on the Standard Scott Tester. At least four dumbbells were pulled for each test.

Calculations of M_c were based on volume swell measurements in those cases where the μ value (interaction coefficient) of the polymer solvent system was known, and on equilibrium modulus measurements

TABLE III—STRESS-STRAIN PROPERTIES OF RADIATION CURES AT OPTIMUM CURE

Polymer	Black (Pts.)	Exposure (Mr)	M_c	Tensile (psi)	Elongation (%)
Neoprene-W	HAF (40)	10	2400	2595	255
Neoprene-GN	EPC (40)	20	3700	2535	450
Styrene rubber (cold)	ISAF (48.7)	30	4400	1785	400
Styrene rubber (hot)	SRF (15)	20	3500	1835	575
Natural rubber	SRF (10)	40	3400	2195	240
Natural rubber	EPC (50)	40	4300	2585	330
Acrylonitrile-butadiene rubber	EPC (50)	10	4400	3530	390
Acrylonitrile-butadiene rubber	FEF (40)	10	4900	1955	285
Kel-F 3700	Monox (40)	25*	——	1900	330
Viton A	MT (18)	12	——	1600	570
Poly FBA	HAF (35)	12*	——	1600	200
Poly FMFPA	HAF (35)	10*	——	1450	200

*Vacuum.

TABLE IV—COMPARISON OF PROPERTIES OF CHEMICAL AND RADIATION CURES AT NEARLY EQUIVALENT VALUES OF M_c

Compound	M_c	Tensile (psi)	Elongation (%)	Dynamic Modulus (psi)	Resilience (%)	Permanent Set (%)	Temperature Rise (°F.)	Abrasion Resistance	Hardness	Freeze Point (°C.)	100% Modulus (psi)
1CFB32	2000	3420	310	2105	63	3.6	66	137	71	–36	640
81RGA7		2720	230	3275	63	2.3	58	168	72	–38	535
1CFB33	2000	3500	420	2555	65	11.3	78	110	75	–36	600
81RGA6		2350	250	2400	55	—	—	121	80	–33	525
1CFB34	2600	2500	330	1335	67	3.9	45	47	63	–61	440
81RGA1		2195	220	790	71	3.2	55	59	61	–60	460
1CFB35	1900	1870	375	1290	35	7.1	66	46	57	–45	325
81RGA8		1800	350	990	40	3.2	76	55	52	–49	130
1CFB36	3700	4600	340	2920	51	—	67	110	73	–15	420
81RGA4		2760	185	2360	52	12.1	98	117	65	–15	300
1CFB37	3500	2720	400	985	59	6.0	38	39	55	–61	265
81RGA2		2400	320	675	66	—	—	82	59	–60	305
1CFB38	3000	2840	395	1440	50	7.1	58	67	59	–47	230
81RGA3		2020	300	1415	50	9.0	89	128	61	–48	265
1CFB39	2100	4080	325	2305	57	2.8	62	120	72	–16	350
81RGA5		1620	135	2010	60	5.9	89	90	80	–16	270

in those cases where μ was not known. The equation applied for volume swell is

$$M_c = \frac{-\rho V_1 \left(1 - \frac{2M_c}{M}\right)\left(v_2^{1/3} - \frac{v_2}{2}\right)}{\ln(1 - v_2) + v_2 + \mu v_2^2} \quad (1)$$

where V_1 = molar volume of solvent,
ρ = polymer density,
M = number average molecular weight of the polymer,
μ = polymer solvent interaction coefficient,
v_2 = volume fraction of polymer at swelling equilibrium,

$$v_2 = \frac{V}{a^3 + V - 1},$$

M_c = average molecular weight between cross-links,
V = volume fraction of rubber unswollen, and
$a = L/Lo$ = swollen length/original length.

The term $(1 - 2M_c/M)$ is usually neglected but may be large at large values of M_c.

The equation applied for equilibrium modulus measurements is

$$T\alpha = \frac{-RT(\alpha - 1/\alpha^2)\quad[\ln(1 - v_2) + v_2 + \mu v_2^2]}{V_1(v_2^{1/3} - v_2/2)} \quad (2)$$

where R = gas constant, 84.5 kg/cm° K^{-1},
T = absolute temperature,
$T\alpha$ = stress (Kg/cm^2) at length ratio α,
$\alpha = L/Lo$.

Substituting from the swelling Equation 1

$$T\alpha = \frac{\rho RT}{M_c}(\alpha - 1/\alpha^2) \quad (3)$$

The above expressions have been derived by Gee *(9)*, Flory *(6)*, and others from the theoretical treatment of the thermodynamic and stress-strain behavior of elastomers. In the case of the simple volume swell measurements, the samples (2 1/3 x ¼ x .025-inch) were swollen in the dark for 24 hours in the appropriate solvent to which had been added 0.1% PBNA to help prevent oxidation.

For the equilibrium modulus measurements, the samples were elongated prior to swelling and held at this fixed length during swelling. After 24 hours, the samples were deswollen in a nitrogen atmosphere and the stress ($T\alpha$) then measured. The elongation factor (α) was normally two and was measured using bench marks and a sliding cathetometer. It should be kept in mind that not only do the chemical cross-links contribute to the value of M_c but also such other factors as chain entanglements and interchain forces.

In order to determine the effect of temperature on the rate of radiation vulcanization, an electrically heated mold was placed in the main chamber of the B. F. Goodrich Cobalt-60 source and samples were irradiated to a total exposure of 3 Mr at various temperatures. Stress strain and M_c measurements were then made on the samples. The flux inside the mold, based on glass slide dosimetry, was 0.082 Mr per hour and resulted in an irradiation time of 39 hours. For natural rubber, samples were heated for 39 hours without irradiation and also heated for the same period after removal from the source to separate the effects of temperature and radiation.

Results of Static and Dynamic Tests

Tensile strength and ultimate elongation of the radiation cures are lower than those of the chemical cures but temperature rise and abrasion resistance are higher (Table IV). In general, other properties such as permanent set, hardness, resilience are nearly equal. The lower maximum tensile and ultimate elon-

TABLE V—STRESS-STRAIN VALUES FOR FLUORINATED ELASTOMERS WITH RADIATION AND CHEMICAL CURES

Compound	Polymer	Cure	Tensile (psi)	Elongation (%)
1CFB30	Kel-F 3700	Chemical	3000	180
1CFB31		Radiation (vacuum) ..	1900	330
81RHA8	Viton A	Chemical	1660	220
81RHA1		Radiation (air)	1600	570
81RGA24	Poly FBA	Chemical	1200	350
81RHA4		Radiation (vacuum) ..	1600	200
81RGA25	Poly FMFPA	Chemical	970	300
81RHA5		Radiation (vacuum) ..	1450	200

gation may result from the fact that scission and cross-linking are competing reactions in the case of radiation vulcanization and scission occurs to a higher degree than in chemical vulcanization. Another possible explanation is that the difference is due to the type and distribution of the cross-links. In actuality, both mechanisms probably contribute to the effect simultaneously.

Only stress-strain measurements were made in the case of the fluorinated elastomers. The optimum radiation cure was determined and the maximum tensile and ultimate elongation was compared with those of the manufacturers recommended chemical cure. Kel-F 3700, FMFPA, and FBA required radiation in vacuum to obtain adequate physical properties. Viton A, however, responded best when irradiated in air. Properties obtained by radiation compare favorably with those obtained by chemical vulcanization and in a few cases are superior (Table V).

Solvent Resistance

According to the kinetic theory of elasticity, the volume swell of a polymer at the same degree of cross-linking should be same independent of the type of cross-link employed (Equation 1). The data in Table VI confirms this theory with two exceptions. In every case, the volume swell of the radiation cures was greater in water than the volume swell of the chemical cures. The difference varied depending on the polymer employed but ranged from 17 to 64% greater swell.

It is believed that the reason for this phenomenon is that when oxygen is present, there is a tendency for any free radicals, formed during irradiation, to form peroxides by a reaction of the type

$$R\bullet + O_2 \longrightarrow \overset{\bullet}{R}O_2 \qquad (4)$$

rather than to form cross-links. In many cases, breakdown of a polymer is more rapid in the presence of oxygen. Entrapped free radicals do exist in polymers after irradiation and raising the temperatures will cause these radicals to react. Certainly in the presence of water at 70°C. both conditions of oxygen and temperature are met.

Actually, the swell of elastomers in water is a completely different physical phenomenon from that of swell in materials which are solvents or partial solvents. The swell is due to a diffusion process of the water into the elastomer and, therefore, the difference in the swells does not actually contradict the kinetic theory of elasticity.

The other exception occurs in the case of the chloroprene rubber samples immersed in ASTM oils 1 and 3. The radiation cures swell less than the

TABLE VI—COMPARISON OF PER CENT VOLUME SWELL OF CHEMICAL AND RADIATION CURES AT NEARLY EQUIVALENT VALUE OF M_c (70 hr. at 25°C.)

Compound	CCl_4	C_6H_6	Water	Oil at 177° C.		Acetone	Hexane
				No. 3	No. 1		
1CFB32	184	190	28	106	22	39	32
81RGA7	185	205	77	76	9	37	28
1CFB33	187	197	18	124	20	39	31
81RGA6	176	161	67	62	5	37	28
1CFB34	284	208	13	*	430	11	162
81RGA1	282	205	20	213	*	12	143
1CFB35	473	266	30	298	109	19	65
81RGA8	347	269	56	289	66	15	76
1CFB36	48	146	2	11	0	192	4
81RGA4	49	176	4	12	0	190	9
1CFB37	380	275	5	293	163	14	199
81RGA2	332	232	14	237	138	15	169
1CFB38	334	293	21	185	70	16	118
81RGA3	344	291	41	259	90	16	112
1CFB39	49	138	5	12	0	167	4
81RGA5	51	152	6	13	1	198	9

*Too swollen to handle for measuring.

TABLE VII—OZONE CRACKING—INDUCTION PERIODS

Compound	Polymer	Cure Type	Additive (phr)	Induction Period (hr.)
1CFB32	Neoprene-W	Oxide	PBNA (2)	48.00
81RGA7		Radiation	———	3.10
1CFB33	Neoprene-GN	Oxide	Akroflex C (1)	32.00
81RGA6		Radiation	Aranox (1)	29.00
1CFB34	Natural rubber	TMTD	PBNA (1)	1.50
81RGA1		Radiation	———	0.61
1CFB35	Hot styrene rubber	Sulfur	———	0.43
81RGA8		Radiation	———	0.33
1CFB36	Acrylonitrile-butadiene rubber	TMTD	———	1.80
81RGA4		Radiation	———	1.70
1CFB37	Natural rubber	Peroxide	PBNA (1)	0.25
81RGA2		Radiation	———	1.20
1CFB38	Cold styrene rubber	Peroxide	Stalite (0.3)	0.33
81RGA3		Radiation	DPPD (0.3)	0.50
1CFB39	Acrylonitrile-butadiene rubber	Peroxide	———	0.42
81RGA5		Radiation	———	1.20

chemical cures in each of the four cases. The difference which varied from 28 to 75% may possibly be explained by the fact that at elevated temperature the modulus of the radiation cures increases at a faster rate than the modulus of the chemical cures. As the modulus increases there is a tendency for absorbed oil to be squeezed out of the elastomer resulting in less volume increase.

Ozone Cracking

The ozone cracking measurements show that radiation cures are no better nor worse than chemical cures and that resistance to ozone cracking is a function of the polymer and additives and is not dependent on the type of cross-link (Table VII). The difference in the induction periods of the chemical cures and radiation cures is insignificant with one exception. The exception is a chloroprene rubber compound (1CFB32) where the radiation cure has an induction period of 3.1 hours while the chemical cure has an induction period of 48 hours. This difference may be caused by the relatively large amount of PBNA (2 phr) in the chemically cured stock.

Oxidation Rates

The oxidation rate measurements (Table VIII) show the radiation cures to have about the same oxidation rate as the unprotected cures and that the rate is very much dependent on the type and amount of antioxidant added. When neither cure contains an antioxidant, the rates are about equal. When one contains an antioxidant and the other does not, the cure with the antioxidant has a much lower rate. The one exception is 1CFB34, a natural rubber compound, which contains 1 phr of PBNA but has no lower rate of oxidation than its radiation cured counterpart 81RGA1.

TABLE VIII—OXIDATION RATES FOR RADIATION AND CHEMICAL CURES

Compound	Polymer	Cure Type	Additive (phr)	Rate, $r_o \times 10^7$ moles/gm/min.
1CFB32	Neoprene-W	Oxide	PBNA (2)	1.8
81RGA7		Radiation	———	13.0
1CFB33	Neoprene-GN	Oxide	Akroflex C (1)	3.7
81RGA6		Radiation	Aranox (1)	33.0
1CFB34	Natural rubber	TMTD	PBNA (1)	3.0
81RGA1		Radiation	———	2.8
1CFB35	Hot styrene rubber	Sulfur	———	1.0
81RGA8		Radiation	———	2.1
1CFB36	Acrylonitrile-butadiene rubber	TMTD	———	3.0
81RGA4		Radiation	———	2.4
1CFB37	Natural rubber	Peroxide	PBNA (1)	3.7
81RGA2		Radiation	———	43.0
1CFB38	Cold Styrene rubber	Peroxide	Stalite (0.3)	2.2
81RGA3		Radiation	DPPD (0.3)	5.9
1CFB39	Acrylonitrile-butadiene rubber	Peroxide	———	1.4
81RGA5		Radiation	———	1.6

Elevated Temperature Studies

The results of testing at elevated temperature showed that the radiation cures retain a greater percentage of their maximum tensile and ultimate elongation than do the chemical cures even though five of the chemical cures contain added antioxidants. When the samples were testtube aged 16 hours prior to testing at room temperature, the radiation cures were about equivalent to the chemical cures at 212°F. and inferior at 300°F. However, if the samples are tested at the same temperature as they are aged, the radiation cures again are superior to the chemical cures at 212°F. and at 300°F. are superior in some cases, inferior in others (Tables IX and X). In Table XI, the various cures employed are ranked in order of retention of maximum tensile and ultimate elongation when tested at 212°F. As is seen, in every case but one, the radiation cure appears to be the most stable.

The effect of the addition of an antioxidant such as PBNA is shown in Figures 3, 4, and 5. Figures 3 and 4 show the retention of tensile and elongation of a gamma cure when aged at elevated temperature but pulled at room temperature, a gamma cure with PBNA and a peroxide cure with PBNA. While the peroxide cure has somewhat better retention of properties than the gamma cure, the addition of 1 phr of PBNA to the gamma cure results in a stock which ages better than the peroxide cure with PBNA.

Figure 5 is similar to Figures 3 and 4 except the retention of stress-strain properties as a function of the test temperature is shown. Once again the benefit of adding PBNA to the radiation cure is shown. The results illustrated are typical of those obtained for all eight of the compounds studied.

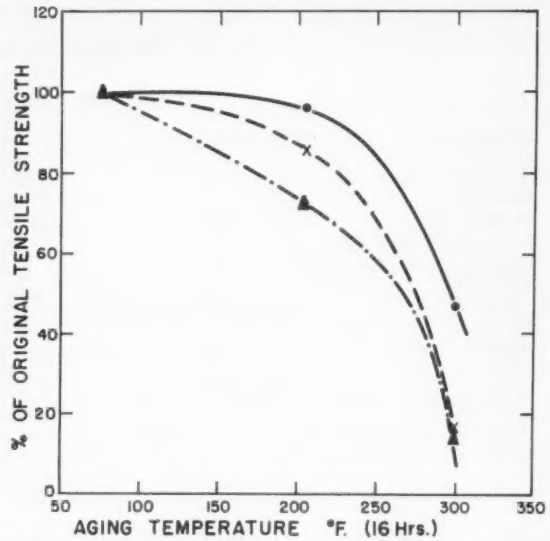


FIG. 3—Effect of aging temperature on original tensile strength of nitrile rubber with 50 phr EPC black.

(Triangle=radiation cure, no PBNA; dot=radiation cure with PBNA; x=peroxide cure with PBNA).

Electron Cures

In order to compare electron cures with gamma cures, ASTM tensile sheets were irradiated using a Van de Graaff accelerator. It was found that while nearly the same maximum tensile strengths were obtained, the electron cures resulted in higher ultimate elongations. There are two differences existing between gamma and electron cures which might well result in a difference in stress-strain properties.

TABLE IX—ELEVATED TEMPERATURE TESTING

Per cent tensile strength retained*

Compound	Cure Type Polymer	Aging Temperature / Test Temperature: Room 212° F.	Room 300° F.	212° F. 78° F.	212° F. 212° F.	300° F. 78° F.	300° F. 300° F.
1CFB32	Oxide cure	36	23	93	32	81	30
81RGA7	Neoprene-W	34	33	73	34	16	6
1CFB33	Oxide cure	42	28	86	38	49	18
81RGA6	Neoprene-GN	44	27	93	21	12	9
1CFB34	TMTD cure	55	29	94	49	31	11
81RGA1	Natural rubber	57	37	84	48	—	—
1CFB35	Sulfur cure	37	22	97	37	66	11
81RGA8	Hot styrene rubber	58	36	90	54	50	14
1CFB36	TMTD cure	27	14	75	24	59	15
81RGA4	Acrylonitrile-butadiene rubber	32	17	100	29	53	16
1CFB37	Peroxide cure	65	31	86	57	16	3
81RGA2	Natural rubber	76	44	73	65	14	2
1CFB38	Peroxide cure	38	22	95	40	74	19
81RGA3	Cold styrene rubber	45	29	93	44	23	4
1CFB39	Peroxide cure	34	19	105	30	100	25
81RGA5	Acrylonitrile-butadiene rubber	29	17	98	29	90	22

*Without aging and at a test temperature of 78° C. all specimens retained 100% tensile strength.

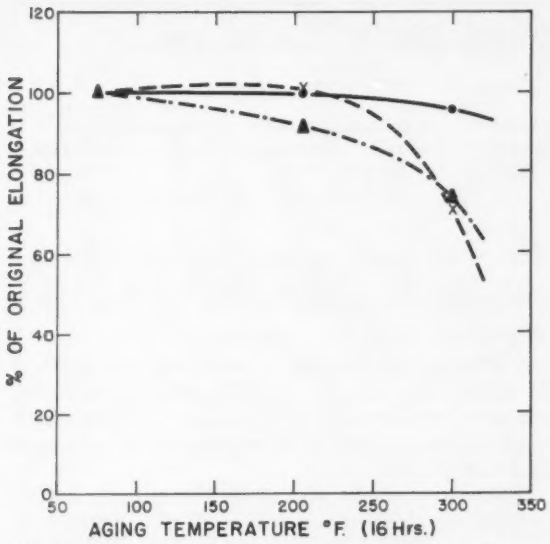


FIG. 4—Effect of aging temperature on original elongation of nitrile rubber with 50 phr EPC black.

(Triangle=radiation cure, no PBNA; dot=radiation cure with PBNA; x=peroxide cure with PBNA)

The amount of time involved in the two cases is quite different. For example, the dose rate of the accelerator is about 2 Mr/min. while the dose rate from the Cobalt-60 facility ranged from 0.2 to 2 Mr/hr. This means the gamma vulcanizates have a much longer period to undergo oxidation. While cross-linking dominates, some chain scission does occur and may be greater in the case of the gamma cures due to the longer period the sample is in a combined radiation oxygen atmosphere.

The second difference is the temperature build-up in the sample. While the gamma cured samples remain nearly at room temperature during the exposure, there is some local heat build up in the electron cures even when steps are taken to cool the samples. This heat might result in somewhat more efficient utilization of the free radicals. It was found that when 1 phr of PBNA was incorporated into the compounds for gamma ray vulcanization the original stress-strain values were improved to the extent that the maximum tensiles and ultimate elongations were higher than for the electron cures (Table XII). These results also tend to substantiate the tendency toward an oxidative reaction.

Effects of Temperature on Cure Rate

The results of M_c measurements on samples which were irradiated while being heated indicated that only natural rubber shows a reasonable increase in cross-linking rate. Styrene rubber showed no significant response. Acrylonitrile-butadiene rubber showed a response only at temperatures of 100°C. and higher where the elastomer will undergo cross-linking due to heat alone, and chloroprene rubber showed a small response below 60°C. but above this temperature a reversion takes place.

As shown in Figure 6, the decrease in M_c as a function of temperature is linear in the case of natural rubber and extrapolation to an M_c of 4000 shows that a temperature of 120°C. would be required to obtain a reasonable cure. Irradiations carried out at this temperature resulted in a badly oxidized sample. Heating alone at 80°C. for 39 hours (time for an exposure of 3 Mr) resulted in an M_c of 46.1 x 10^3. Post-heating 39 hours at 80°C. resulted in an M_c of 12.5 x 10^3. The M_c values obtained indicate that

TABLE X—ELEVATED TEMPERATURE TESTING

Per cent elongation retained*

Compound	Cure Type Polymer	Aging Temperature / Test Temperature: Room 212° F.	Room 300° F.	212° F. 78° F.	212° F. 212° F.	300° F. 78° F.	300° F. 300° F.
1CFB32	Oxide cure	73	56	94	68	78	57
81RGA7	Neoprene-W	74	108	84	76	24	4
1CFB33	Oxide cure	65	56	78	59	33	19
81RGA8	Neoprene-GN	73	48	54	28	4	4
1CFB34	TMTD cure	92	56	91	81	62	62
81RGA1	Natural rubber	98	89	94	96	—	—
1CFB35	Sulfur cure	60	43	91	47	53	20
81RGA8	Hot styrene rubber	64	27	104	62	57	35
1CFB36	TMTD cure	48	28	75	45	47	18
81RGA4	Acrylonitrile-butadiene rubber	55	37	79	48	32	16
1CFB37	Peroxide cure	125	102	101	121	71	51
81RGA2	Natural rubber	130	120	92	123	73	37
1CFB38	Peroxide cure	69	51	111	94	70	50
81RGA3	Cold styrene rubber	71	60	97	71	52	21
1CFB39	Peroxide cure	65	44	103	58	65	33
81RGA5	Acrylonitrile-butadiene rubber	49	32	85	47	47	16

*Without aging and at a test temperature of 78° C. all specimens retained 100% tensile strength.

TABLE XI—PER CENT OF INITIAL STRESS-STRAIN PROPERTIES RETAINED WHEN PULLED AT 212°F.

Cure Type	Neoprene		Cold Styrene Rubber		Natural Rubber		Acrylonitrile-butadiene Rubber	
	Tensile	Elongation	Tensile	Elongation	Tensile	Elongation	Tensile	Elongation
Sulfur	—	—	29	54	39	75	—	—
TMTD	—	—	—	—	55	92	27	48
Oxide	42	65	—	—	—	—	—	—
Peroxide	—	—	38	69	65	125	34	65
Radiation	44	73	47	81	66	126	31	52

heating alone results in very little cross-linking, but that when a sample has been irradiated there would seem to be entrapped free radicals present which are made to react by raising the temperature of the material. In the presence of heat and radiation, there is probably no increase in the number of radicals formed but those which are formed are utilized more efficiently. An exposure of 3 Mr was chosen because this is the dose at which radiation vulcanization becomes competitive on a cost basis with chemical vulcanization.

Economics

In order to make radiation vulcanization economically competitive with conventional vulcanization, the cost must be lowered by a factor of approximately 10. This can be achieved by lowering the cost of radiation or by lowering the amount of radiation required for optimum cure. In the former case, either a major breakthrough must be made in electron accelerator technology or radioisotopes must become available at a much lower cost. By radioisotopes, long life materials such as Cobalt-60, spent fuel elements, and radioactive reactor by-products are inferred.

An optimistic cost estimate for which Cobalt-60 may sell for in the next decade is 34 cents per curie. To be competitive with a 10 kw, 2 mev, General Electric resonant transformer available today the cost would have to be 18 cents per curie. Present cost is from 2 to 5 dollars per curie depending on the specific activity of the material. Recently the AEC announced a price reduction for cesium 137. The cost of this isotope is now 1 to 2 dollars per curie depending on the specific activity. To be competitive with the 10 kw resonant transformer, cesium 137 would have to sell for 33 cents per curie. Cost of spent fuel elements and radioactive by-products will depend on the speed with which our nuclear power program moves ahead, but it is not anticipated that costs of these materials will be drastically reduced within the next 10 years.

Based on 100% efficiency of the 10 kw resonant transformer, the cheapest source of radiation today, the cost of radiation is 0.4 cents per megarep pound. This gives a cost of vulcanization of from 4 to 20 cents per pound depending on the elastomer employed. Since 100% efficiency is not usually realized but 50% is more realistic, a more accurate cost is 8 to 40 cents per pound. At 50% efficiency, a 10 kw resonant transformer could process 150 pounds of stock per hour if the exposure required for vulcanization was 30 Mr.

For comparison at other doses, the capacity is 4700 pounds per megarep per hour at 50% efficiency. A 10 mev, 400 kw linear accelerator postulated by Applied Radiation Corp. would have a capacity of 190,000 pounds per megarep per hour at 50% efficiency. For a vulcanization exposure of 30 Mr, the capacity would then be about 63,000 pounds per hour. The cost at 50% efficiency would be 0.15 cents per megarep per pound of 4.5 cents per pound at 30 Mr. These cost calculations are from data published by C. Stockman and R. Bauman *(19)*.

One consideration which must be kept in mind when radioisotopes are being considered as a radiation source is the flux. Radioisotopes such as Cobalt-60

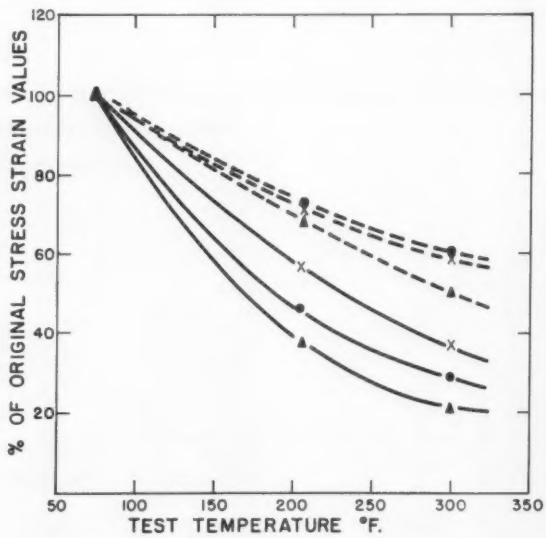


FIG. 5—Effect of test temperature on stress-strain values of cold styrene rubber with 48.7 phr ISAF black.

(Dot=radiation cure, no PBNA; x=radiation cure with PBNA; triangle=peroxide cure with PBNA; solid line=tensile strength; broken line=ultimate elongation).

TABLE XII—EFFECT OF ANTIOXIDANT ON STRESS-STRAIN VALUES

Polymer	Reinforcements (Pts.)	Dose	γ No PBNA Tensile	γ No PBNA Elongation	β No PBNA Tensile	β No PBNA Elongation	γ + PBNA Tensile	γ + PBNA Elongation
Natural rubber	EPC (50)	50 Mr	2210	300	2045	370	2685	415
Cold styrene rubber	ISAF (48.7)	25 Mr	2280	310	1970	425	2790	580
Neoprene-GN	EPC (40)	20 Mr	2150	400	2025	625	2340	580
Neoprene-W	HAF (40)	10 Mr	2385	250	2305	355	2745	355

have a limiting flux of about one Mr per hour. With spent fuel elements from a reactor, fluxes of about 10 Mr per hour may be achieved but only for a short time as the decay rate is high in the early stages of the life of the element. The equation for the flux of a single element for time (t) after removal from the reactor is

$$f\,(r/hr) = 4.2 \times 10^7\, t^{1.21} \qquad (5)$$

Therefore, for purposes of vulcanization of elastomers, the insource time of the materials could vary from 1 hour to about 50 hours depending on the flux and elastomer employed.

For modern mass production methods the flux should be high for rapid treatment; if not, the source volume must be large to accommodate a large amount of material at one time. With isotopes either criterion is difficult to achieve. With high-speed electron accelerators, the first criterion can be met. The difficulty in the case of high-speed electron accelerators, is the limit of penetration. With a 2 mev, 10 kw resonant transformer, the limit of uniform exposure using irradiation from both sides is about 0.5 inches at unit density *(11)*. A 3 mev, 3 kw Van de Graaff accelerator has a limit of about 0.8 inches under the same conditions *(7)*.

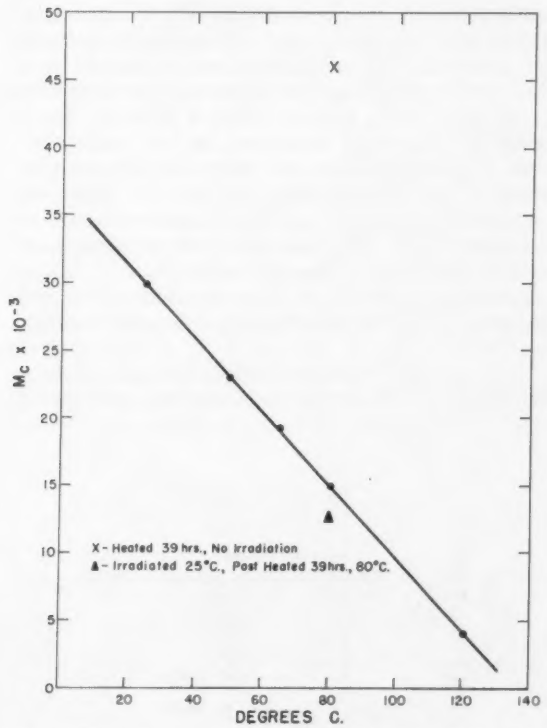


FIG. 6—Effect of temperature on nitrile rubber cross-linking rate (exposure 3 Mr).

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A New Method for Evaluating

Rubber to Metal Adhesion

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IN MEASURING the strength of a rubber-to-metal bond, it is often adequate to demonstrate that failure occurs in the rubber rather than at the bond. Typical of such tests is the sampling of manufactured bonded rubber products. When the test objective is the comparison of the strengths of bonds obtained with various adhesives or the effects of other variables, the requirements become considerably more demanding. No longer is a "go, no-go" test an adequate one, for the experimenter desires not only to distinguish between relatively good bonds and virtually no bond at all, but he also wants to be able to detect differences between systems, all of which have relatively high bond strength. It is the writer's contention that none of the presently accepted and widely used rubber to metal bond evaluation tests are sensitive enough to meet these requirements.

In a recent series of "round robin" tests in which a modified ASTM adhesion test was being evaluated, it was necessary to use inferior bonding techniques purposely to obtain a bond failure; otherwise no data would have been available for comparing the modified method with the parent method. Those who have had experience with existing methods are probably aware that interpretations of bond strength, based on a visual observation of a failure in which both rubber and bond are in evidence, are often incorrect. Quite often, an inspection of the breaking force will lead to an opposite conclusion. This paper discusses the test results obtained with a new rubber-to-metal bond evaluation technique which appears to overcome the difficulties of present methods.

In the course of developmental work on an experimental vibration isolator, it was found that a certain metal surface contour to which the rubber was bonded consistently gave low bond strength despite repeated efforts to improve adhesion. Inspection of the metal part after an ultimate strength test revealed that one portion of the area to which the rubber had been adhered was virtually free of rubber. It appeared that failure occurred at the rubber-adhesive interface, although in one or two instances the metallic surface was in evidence. These results indicated that we could possibly exploit our difficulties to an advantage and develop a superior test for evaluating rubber to metal bond strength.

Conical Adhesion Test

It seemed reasonable that we could develop a metal surface contour which would virtually assure a bond failure over the entire area. After several attempts, we arrived at the specimen shown in Figure 1, in which the rubber was bonded between two opposing metal parts having conical adhesion surfaces. It was found by the visual inspection method used in the tests that this specimen not only gave failure at the bond in almost every case, but that the scatter between test results on "identical" specimens was remarkably small. Reproducibility of the test results and the sensitivity of the test can perhaps be best indicated by a discussion of three experimental test programs in which the new bonding evaluation technique was used.

The objective of the first test was one of comparing the bond strength of four commercially available ad-

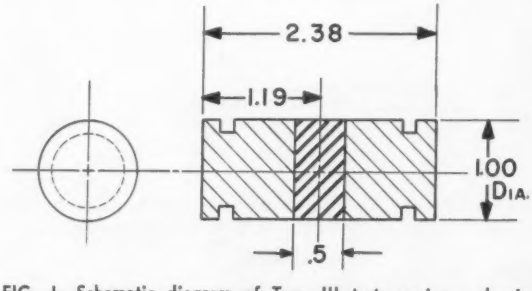


FIG. 1—Schematic diagram of Type III test specimen, showing conical adhesion areas.

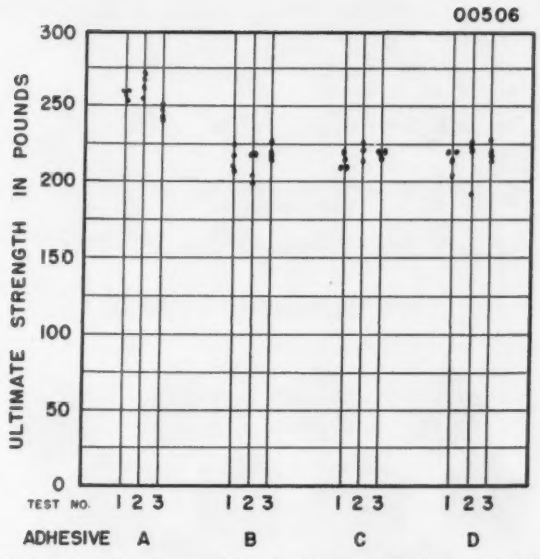


FIG. 2—Breaking forces obtained with four adhesives used with Type III specimens.

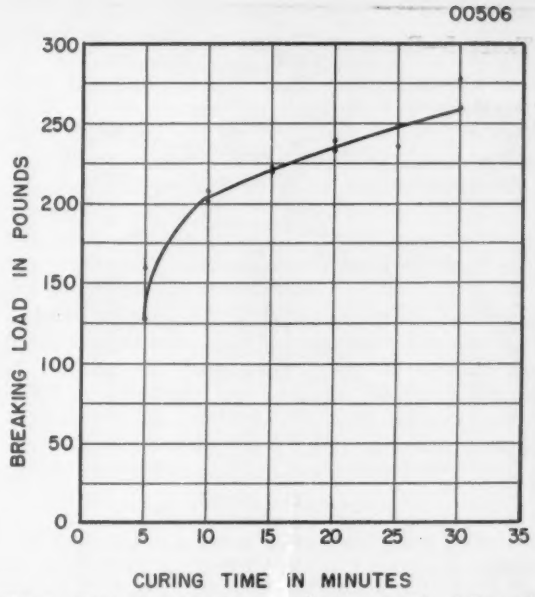


FIG. 3—Effect of curing time on adhesive strength of Type III test specimens.

hesives using the same natural rubber compound in all cases. Test specimens were made with each of the four adhesives and broken. After a two week period, an additional group of specimens was made from the same compound and tested. The same procedure was followed after an additional two week period. The results obtained are shown in Figure 2. The data presented here reveal that the strength of rubber to metal bond was remarkably reproducible. Three of the adhesives gave almost identical bond strength while the fourth was consistently superior, although not markedly so.

In a second test program it was desired to determine the effect of curing time on bond strength. Two specimens were cured at each curing time and the breaking loads are indicated in Figure 3. Here again the reproducibility of the test results is seen to be excellent and the effect of curing time upon bond strength is clearly in evidence. In no case did a visual examination of the metallic surface show rubber to be present.

The object of a third test program was one of comparing the sensitivity of the new test method with other types. The following methods were evaluated from the standpoint of their ability to detect any difference in adhesion resulting from grit blasting the metal parts:

(1) Specimen Type I—90 degree stripping test (ASTM designation D429-56T, Method B);
(2) Specimen Type II—Rubber part bonded to parallel metal surfaces—similar to ASTM designation D429-56T, Method A (Figure 4);
(3) Specimen Type III—New method with conical metal parts (Figure 2).

Chemlok 220 adhesive was employed and the composition of the rubber compound was as follows:

Smoked Sheet	100
EPC Black	25
ZnO	10
Stearic Acid	2
Pine Tar	2
Neozone D	1
Altax	1.5
Methyl Zimate	0.2
Sulfur	2.75

Half of the test samples, for a given speciment type, were made with metal parts which had been degreased with trichloroethylene, and the remaining half were degreased, grit blasted and degreased again. A Dillon Tester was used to measure breaking strength. The following total number of samples were evaluated for each type: Type I—12, Type II—20, Type III—12.

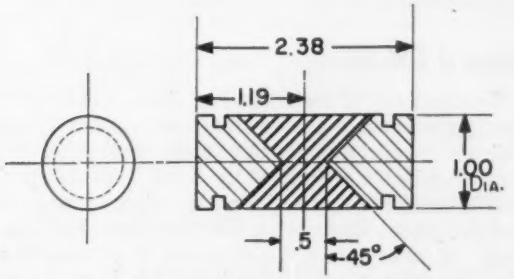


FIG. 4—Schematic diagram of Type II specimen, showing rubber bonded to parallel metal surfaces.

Experimental Results

All Type I specimens had a 100% rubber failure and the only conclusion as to the effect of surface treatment which could be reached was simply that in all cases adhesion was sufficient to prevent a failure at the bond.

TABLE I—BREAKING FORCES RECORDED ON TYPE II & III SPECIMENS

Type II Specimen No.	Surface Treatment	Breaking Force (lbs.)
1	Degreased	1330
2	Degreased	1310
3	Degreased	1475
4	Degreased	1215
5	Degreased	1375
6	Degreased	1245
7	Degreased	1375
8	Degreased	1310
9	Degreased	1200
10	Degreased	760
Mean		1259
11	Grit Blasted	1215
12	Grit Blasted	1210
13	Grit Blasted	1375
14	Grit Blasted	1250
15	Grit Blasted	880
16	Grit Blasted	1325
17	Grit Blasted	1040
18	Grit Blasted	1425
19	Grit Blasted	1340
20	Grit Blasted	1310
Mean		1237

Type III Specimen No.	Surface Treatment	Breaking Force (lbs.)
1	Degreased	165
2	Degreased	134
3	Degreased	161
4	Degreased	147
5	Degreased	163
6	Degreased	147
Mean		152
7	Grit Blasted	188
8	Grit Blasted	180
9	Grit Blasted	188
10	Grit Blasted	196
11	Grit Blasted	198
12	Grit Blasted	190
Mean		190

TABLE II—ANALYSIS OF VARIANCE

TYPE II SPECIMENS

Source of Estimate	Sum of Squares	Degrees of Freedom	Mean Square	F
Between Metal Treatments	2,531	1	2,531	.07*
Within Treatments	584,133	18	32,451	
Total	586,664	19		

* Not statistically significant.

TYPE III SPECIMENS

Source of Estimate	Sum of Squares	Degrees of Freedom	Mean Square	F
Between Metal Treatments	4,144	1	4,144	43.6**
Within Treatments	949	10	94.9	
Total	5,093	11		

** Very highly significant.

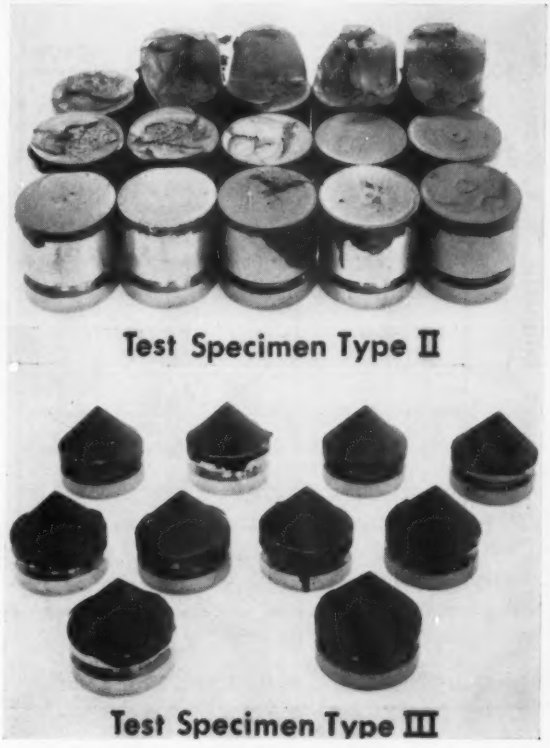


FIG. 5—Broken Type II and Type III test specimens, as they appear after failure.

Type II specimens gave an erratic pattern of failure. Six of ten grit-blasted specimens had virtually a 100% rubber failure, while only one of the ten samples whose metal parts had been only degreased failed in the rubber part. The breaking loads (Table I) gave no indication of a difference in adhesion due to surface treatment.

Type III specimens all failed at the bond. The breaking force data indicated that a superior bond was achieved in specimens whose metal parts had been grit blasted. A variance analysis of results obtained on Type II and Type III specimens is given in Table II. The analysis indicates that with Type III specimens the probability that grit blasting gives a superior bond is greater than 99.5%! The difference in bond strength obtained for the two surface treatments in Type II specimens is not statistically significant. A photograph of broken Type II and Type III specimens is shown in Figure 5.

Pattern of Bond Failure

The tendency of the conical specimen to fail at the bond rather than in the elastomer, even when the adhesion is excellent, apparently results from stress concentration in the vicinity of the bond. As the specimen is loaded, failure begins at the points of the cones and progresses down along the sides until it is complete. If, after failure, the elastomer is cut away from the opposite end, one almost invariably finds that the failure is almost complete at that end also.

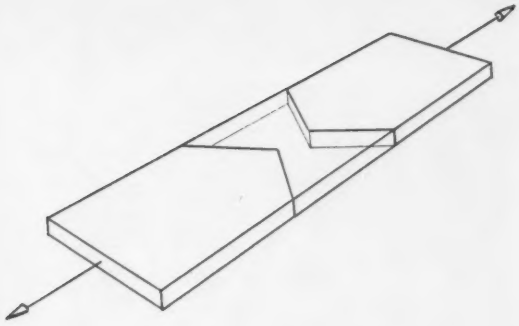


FIG. 6—Diagram of photoelastic specimen tested for constant shear stress.

An attempt was made to examine the stress distribution by loading a photoelastic specimen of the type shown in Figure 6. It will be noted that the metal parts in the photoelastic specimen were wedge shaped rather than conical and that the elastomer (actually a flexible epoxy material) had flat sides. Although the photoelastic model was quite different in shape from the test specimen, it appears reasonable to assume that the general pattern of stress distribution is somewhat similar.

The frontispiece is a photograph of isochromatic lines (lines of constant shear stress) obtained under load. It can be seen that the highest stress occurred at the cone ends and that minimum stress occurred at the outer boundaries of the elastomer. Although we have obtained no photograph of isochromatics during failure, the nature of the failure in the adhesion test specimen would indicate that the stress remains concentrated along the circle where the elastomer is peeling away from the metallic cone.

In conclusion, it is important to point out that in some instances the new test specimen has not given a failure at the bond. Elastomer failure can result when the elastomer has very poor tear strength and the adhesion is excellent. In most instances, however, the method has given highly satisfactory results and has proved to be exceedingly sensitive.

ACKNOWLEDGMENT

The author is indebted to Mr. William DeCrease of the Hughson Chemical Company who supervised the preparation and testing of the specimens used in the third test program.

Coming Soon . . .

Carbon Black Loaded, Cross Linked Polyethylene in Wire and Cable—By B.B.S.T. Boonstra, Godfrey L. Cabot, Inc., Cambridge, Mass., and Allen C. Bluestein. Anaconda Wire & Cable Co., New York, N. Y.

A report on a new class of materials with greater resistance to shrinkage and stress cracking.

True Injection Molding of Rubber Compounds—By Edward W. Hollis, Lewis Welding Engineering Corp., Bedford, Ohio.

Reducing material costs to a minimum through automatic control of molding variables promises faster cycle time and reduction of scrap loss.

Radiation Resistance of the Neoprenes—By Robert Harrington, Hanford Atomic Products Operation, General Electric Co., Richland, Wash.

The sixth in a series of articles concerns the effects of ionizing radiation on the physical properties of neoprene polymers, with comments on the potency of selected compounding ingredients.

Black Masterbatch Panel Discussion—By Southern Rubber Group, St. Petersburg, Fla.

Three papers presented at the Summer Meeting discuss continuous vulcanization, production of dispersant type black masterbatches, and their uses in compounding.

Castor Polyol Urethane Elastomers—By T. C. Patton, A. Ehrlich and M. K. Smith, Baker Castor Oil Co., Bayonne, N. J.

Proper selection of prepolymer castor polyols insures tailor-made physical properties of low-cost compounds with numerous commercial applications.

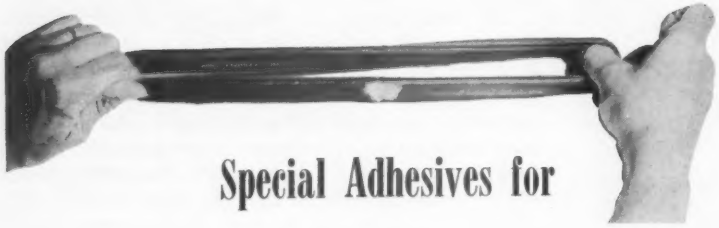
Improved Butyl Rubber Vulcanizates—By C. J. Jankowski, K. W. Powers and R. L. Zapp, Enjay Laboratories, Linden, N. J.

How superior butyl rubber vulcanizates are obtained by replacing normal sulfur loading and accelerator with sulfur donor and low sulfur-high accelerator vulcanization systems.

PLUS R/A SPECIAL INDUSTRY REPORT

Towards More Efficient Purchasing

A round-up on purchasing techniques used by some major rubber manufacturers.



Special Adhesives for

Rubber Products in the Automotive Industry

PRODUCTION of many automotive rubber parts at the Charlestown, Mass., plant of the Davidson Rubber Co. hinges upon the solution of particular bonding problems. But joints have long posed a problem. Design and product engineers are continually advised by adhesives manufacturers to avoid this crucial bonding situation. However, design features make butt joints mandatory for Davidson in the manufacture of much of the weatherstripping used on the doors of the nation's automobiles and trucks.

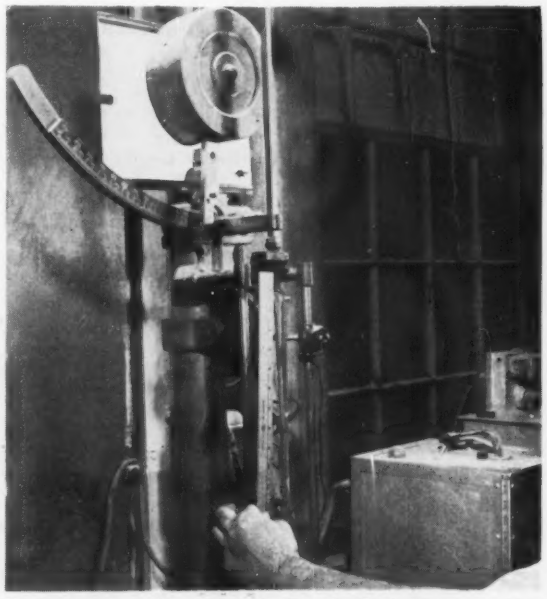
A Bostik adhesive, made by the B. B. Chemical Co., Cambridge, Mass., is making it possible to bond these butt joints so that torture tests conducted by Davidson have proven the bonds to be stronger than the rubber itself.

Currently in production is weatherstripping for Ford truck doors. The first step is the formulation of the rubber strips in varying lengths. Davidson's presses are able to make strips up to eighteen feet in length. The truck door contours and dimensions are such that six sections of rubber strip of varying lengths must be bonded, one to the other. This necessitates, of course, five separate bondings, and all of them are at butt joints.

Obviously, the setting-up time of the adhesive is a critical factor in this production. The butt surfaces are dipped in the adhesive, clamping devices are used to hold the joints together, and then the complete unit of weatherstripping is conveyed through heated curing ovens where the temperature is in the vicinity of 200° F. The only reason for the use of the clamping device is the extremely awkward, snake-like shape of the weatherstripping and its three sharp-angled corners.

Another application of the same adhesive is that for Davidson's high-speed assembly of clicker or die-cut gaskets. Currently, such gaskets are being made for use on heaters in General Motors automobiles. Here again, a butt joint is accomplished with the adhesive at four separate spots, but only manual pressure by the operator is necessary to set up initial adhesion before gaskets enter the curing oven on a belt. No clamping device is needed. Again, the adhesive is applied by means of a simple dipping process. The same result occurs: the adhesion is unaffected by any subsequent rough handling or fitting during auto assembly. Tests indicate that a break will occur at a spot other than that where the adhesive was applied.

Another large-scale production for the automotive industry at Davidson is that of round rubber seals for air ducts on air conditioners for such cars as Lincoln, Mercury and Edsel.



Tensile testing machine checks quality of adhesive bond in rubber strip. Break must occur at point other than joint.

Operator pulls 18-foot sheet of weatherstripping from press at Davidson Rubber plant in Charlestown, Mass.

More adhesive is poured for joining operation on assembly line. Sections then go to ovens for final bonding.

An interesting operation here is the one that makes round rings out of straight pieces. Molded shapes are produced on sponge rubber in multiple molds, but for compactness, high production, mold simplicity and economy, all pieces are straight.

To form them into rings, it is necessary to use only a simple device to shape them into a round configuration and, more important, to accomplish effective bonding. First, the butt ends are dipped in the adhesive. Then the strips are placed within jigs shaped like the finished seals. The rubber strips are under slight compression and, conforming themselves out against the jigs, become shaped while their ends are held firmly together at the same time. Finally, the jigs with the seals in them pass through heated chambers on conveyors, to complete the conforming job and cure the adhesive. Permanent bonds with the same excellent qualities as the weatherstripping and the gaskets are the result.

The development of adhesives for such special purposes in automotive products and for general purposes, as well, has been stimulated by many factors in recent years. One of these is the trend in many products toward rubber based and plastic resin components for housing sealing, vibration isolation, noise dampening, and many other functional and appearance purposes. In some cases, strength is a factor, as it is certainly at Davidson where the butt joint use necessitates a formulation that provides high ultimate strengths. In other cases, service conditions are the primary consideration. Perhaps most important are adhesives and methods like these that will help to fabricate a component or finished product at less expense by saving material or operations.

Examples of service conditions that adhesives must resist are: exposure of the joint to corrosive fumes or liquids; high humidity or moisture; high velocity blasts, as in aircraft; and joint flexure, as in many components. Because of the infinite number of formulations that are available in many basic types, such as the rubber, resin, and epoxy groups, the designer does not have the clear-cut choice in specification that is available to him with a rigid fastener.

The following recommendations will help insure the selection of the best adhesive for a particular application:

(1) First consider product function. Investigate not only strength requirements, but any unusual requirements that are to be encountered in service.

(2) Compare the characteristics of standard adhesives as they apply to the materials to be bonded. Try them first if they look appropriate.

(3) Next investigate the possibility of a special formulation that will better fit the particular requirement.

(4) Check with adhesive suppliers on other applications using the same formulations and the success that has been enjoyed with them or, conversely, the reasons for their failure.

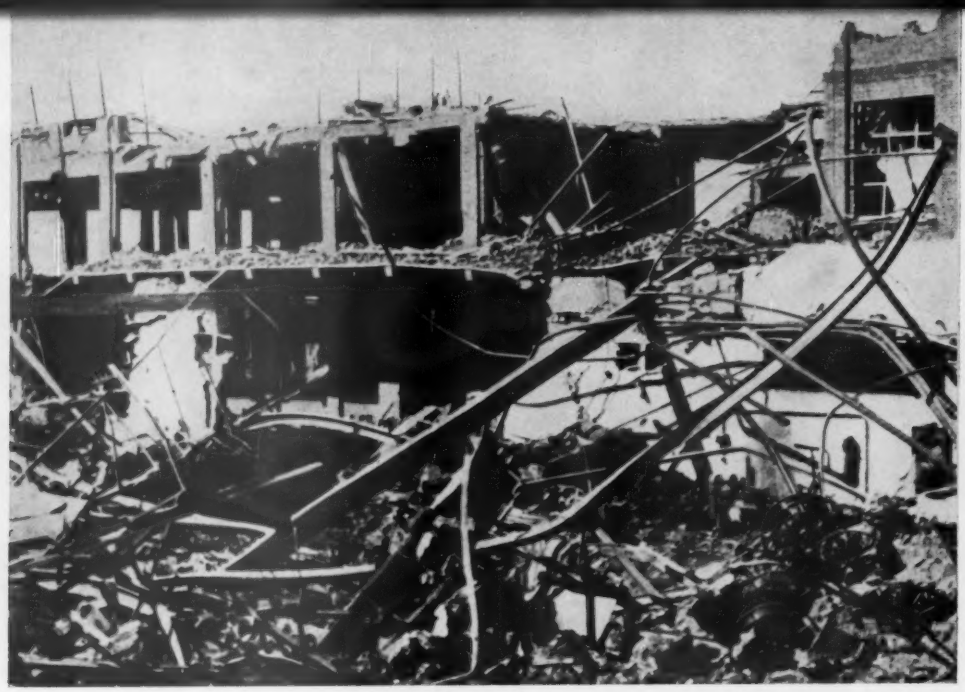
(5) Consider problems of application, whether by brush, spray, roller coating, troweling, dipping or other means. Often, the production advantages represent the only really significant difference in performance between two very close formulations.

(6) Check the method of curing—air, oven, infrared heat, or other methods—and the time required to effect the cure.

(7) Determine the form in which the adhesive is available and, of course, cost of one type versus another.

(8) Finally, subject the actual assembly to production laboratory tests in order to double check its applicability.

These are general requirements only. Close cooperation between the user and supplier is generally necessary to obtain best results.



Allied bombing raids near the close of World War II laid waste to German rubber factories like this one at Fulda.

European Report: GERMANY

GERMANY is a two time loser in the minds of most Americans, but, paradoxically, she is today a vital and essential force in what General de Gaulle has called "a period of great ensembles." The bickering petty nationalism which has twice plunged the whole world into war appears to be on the wane and Europe is in the process of becoming one of the world's "great ensembles" with Germany in a pivotal position.

In 1948, after three years of occupation, West Germany reformed her currency and became virtually autonomous. At the same time she was faced with a tremendous decision: Was she to become socialistic, following the English and Northern European patterns with their tight controls and high taxation, or would her policies be different? The government at Bonn decided that rather than "socializing" Germany's future, they would base her economy on incentive; she would rely on competition rather than on a planned economy. This decision to adopt a free market has given rise to what has been aptly called the "German miracle."

Postwar production increased tremendously, per capita figures showing a 115% rise from 1949 to 1957. In 1948 while the United Kingdom produced 328,000 automobiles, West Germany produced only 30,000. In 1958, however, West Germany produced 950,000, bettering the United Kingdom's production by more than 100,000 units. Rubber production kept pace with automotives in a consistent year-to-year advance in spite of poor demand for truck tires owing to restrictive truck-traffic legislation.

Most Americans familiar with the rubber industry are aware of the phenomenal accomplishments by the United States during the war years in the development of synthetic rubber and are acquainted to a certain extent with the thousands of production problems which developed in the conversion of the new rubber into necessary and strategic items. Several years were necessary together with the cooperative efforts of all American technologists to develop compounds suitable for the replacement of natural rubber in domestic and military service. Few people, however, are familiar with the trials and tribulations of the German technologists in achieving this aim during the same period. A lengthy interview with Reinhard Dietert, head of the Bayer, Leverkusen, "K" (Kautschuk) Department for Sales and Research Development, revealed some details of this story.

Production for World War II

Although the first synthetic rubber had been developed in Germany during the years 1909 to 1912, from that time on the Leverkusen rubber laboratories had been working to improve the original methyl or

Modern facilities soon replaced wartime rubble. This is the new headquarters of Continental Gummiwerke, Hannover.

The second of a series of articles on the rubber industry in Europe considers the factors behind German recovery

By JAMES B. BRADEN
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sodium rubber. Bayer personnel claim to have invented the emulsion polymerization process for styrene and butadiene, as well as for butadiene and acrylonitrile through the efforts of Dr. Konrad about 1932.

As Hitler rose to power and his military ambitions took shape, it became apparent that an adequate substitute for natural rubber was essential to his success. Although Bayer at that time was in production of special purpose rubbers, it had only an experimental pilot plant with a capacity of 200 tons per month designed to develop a general purpose synthetic rubber.

Field Marshall Goering personally took charge of the expansion of the synthetic rubber industry. During a special visit to Leverkusen, Goering ordered Bayer to start construction of a full scale production plant for synthetic rubber. The Bayer technologists advised Goering that they did not have a suitable rubber ready for production, that their buna rubbers #25 to #58 had only fair properties with very low tensiles and rebound; #32, for instance, was a syrup-like substance which, although vulcanizable, was suitable only as a softener. Their buna rubbers #85 and #115, which looked promising, had not yet been completely tested. Goering insisted, however, that construction on the plant must start immediately, based on what knowledge was available. Bayer pointed out that these types of rubber were also too expensive, but Goering (after a phone call to Berlin, presumably to Hitler personally) ordered the price of natural rubber increased as of that moment from 1.50 DM to 2.80 DM, this increase to be used for the development of synthetic rubber. This done, he ordered Bayer to proceed with construction at once.

The first plant had a scheduled capacity of 2000 tons per month, but before it was completed a second plant was authorized with a capacity of 20,000 tons. Again, before this plant was completed, another for 40-60,000 tons per month was started. The last plant started was intended to have a capacity of 120,000 tons per month but it was not finished before the end of the war; it was to be located in what is now Poland.

Another big problem which confronted the Germans was the fact that, although they had been able to produce the synthetic rubber itself, there was no domestic source of carbon black. Goering again arbitrarily authorized Bayer to produce a synthetic carbon black. Work was started immediately eventually carbon black was synthesized by the process of burning naphthylene into a channel black known as BN-500. The wartime industries were soon confronted with another problem, the shortage of naphthylene. Working with a Czechoslovakian firm, Bayer developed the antrozaen method, and the current CK-3 and CK-4 brands of carbon black began to be produced at Dortmund.

Postwar Reconstruction

Currently one receives conflicting appraisals of the amount of war damage suffered by the synthetic rubber industry, but apparently it was not sufficiently severe to curtail production. Dr. Paul Stoecklin, chief chemist of Bayer's Rubber and Rubber Chemicals Division, recalls that from his laboratories they watched Allied bombers drop their bombs on other parts of Leverkusen but that, peculiarly enough, in most instances the bombings stopped short of the Bayer property.

After the war, the Allied Command insisted that all synthetic rubber plants in zones under their control be dismantled. Synthetic plants in the Russian Zone, however, were not closed down but were kept in operation and production was actually increased. Research and development work in West Germany also was forbidden and it was not until after Germany became autonomous that work on general purpose synthetic rubber was resumed, with American technological assistance.

Against this background, the official opening of the Bunawerke Huels on September 15, 1958, marked an important milestone in postwar German synthetic rubber production. With its initial production of 45,000 (capacity 70,000) tons of cold rubber per year, it will meet about one fourth of the total crude rubber requirements of the Federal Republic. Bunawerke Huels also supplies Farbenfabriken Bayer with butadiene for its Perbunan production. Bayer, sole West German producer of Perbunan N and Perbunan C, has expanded its capacity for these types of rubbers and is now more than doubling production levels to 12-15,000 tons of each per year. The Bunawerke Huels plant was formed and is jointly owned by Chemische Werke Huels, Badische Analin & Sodafabriken A.G., Farbenfabriken Bayer A.G., and Farbwerke Hoechst A.G. It is of significance that this one plant now produces more than four times the total amount of synthetic rubber (11,788 tons) produced by the entire Federal Republic of Germany in the record year 1957.

Knapsack-Griesheim A.G., a wholly owned subsidiary of Farbwerke Hoechst A.G. of Frankfurt, has begun production of chloroprene near Cologne and is the first European producer of this basic material for neoprene type rubbers. Its production will be used by Farbenfabriken Bayer A.G. who are producing the neoprene synthetic rubber.

Outlook for the Common Market

The June issue of *Kautschuk und Gummi* gave the March, 1959, estimates of the total Common Market production capacity for synthetic rubber as 199,000 tons for 1960. However, with Bayer's projected increase for Perbunan production and the expansion potential of Bunawerke Huels, this could reach 250,000 tons. The Common Market is at present using less than 25% of its total new rubber (53,000 tons in 1957) as synthetic. As the usage of synthetic rubber increases, it is expected that, unless surpluses from the U.S. flood the market, the Common Market itself could use its entire production with no margin for export.

Dr. Detlev Schmidt, technical director of the Deutsche Kautschuk Gesellschaft (a technical society for rubber chemists and engineers), and his staff at Frankfurt are doing a remarkable job in the translation and dissemination of technical information to the German technician. Their monthly reports give abstracts of most published foreign works pertinent to the rubber field. It is their hope that faster service can be obtained in translation from all languages into English and German for a more efficient exchange of ideas between countries.

The Wirtschaftsverband der Deutschen Kautschukindustrie e. V., also located at Frankfurt, is the German Rubber Industry Association. Dr. Schmidt is also Technical Vice President of this organization which publishes statistics on world-wide as well as German rubber production and consumption. Of approximately 200 rubber processing firms in the Federal Republic, over 160 are members of this organization.

Current Rubber Products

At Vorwerke und Sohn in Wuppertal, Wilhelm Kunst and Graf Von Armansperg were justly proud of their modern mechanical goods rubber plant. Their wrapped and braided hose section has been completely rebuilt and now occupies a room under one of the largest unsupported roofs in the world. Here they can manufacture wrapped-rod cured hose up to 80 meters in length, including recently developed wire-reinforced and fluted hoses for steam and other industrial uses. Here also has been installed a new modern rubber storage area where rubber is delivered directly from railroad cars to subterranean concrete vaults separated from each other by fire-proof walls.

Mr. Rolf Doerken of Rhenania Stanz und Emaillierwerke GmbH in Schwelm is presently producing a line of plastic (polyethylene) household goods similar to the Rubbermaid line in the United States, including buckets, washbasins, dish pans and salad bowls. Consumer acceptance is enthusiastic and they are anticipating expansion in the near future.

Developing New Tires

At Continental in Hannover and at Phoenix in Hamburg-Harburg one gets the impression that there is considerable concern over the "steel reinforced" tire being made by Michelin. These tires are constructed about a single ply of steel wire and are reported to have about 2 to 2½ times the wear of other commercial tires currently being built elsewhere. These figures seem to be confirmed at the various plants visited and the indications are that Michelin will have a considerable advantage over German tire manufacturers. Although Goodyear has been licensed to use the Michelin patents, use is restricted

to Goodyear's wholly owned plants, which means that only the Luxembourg plant will be able to compete with Michelin on the Continent. The Michelin Reifenwerke A.G. at Karlsruhe, a subsidiary of the French Tire Factory Michelin & Cie. in Clermont-Ferrand, rebuilt its plant during 1956 and 1957 and started to produce tires in the middle of 1958. This firm in the meantime was importing tires from France.

Although truck operators interested in saving weight have been pressing for a tubeless truck tire, the German tire industry has not been able to solve this problem, particularly in the bead construction. This is due to a certain extent to the varied types of truck wheel rims in use. By tacit agreement among members of the tire industry, they will not enter into tubeless truck tire production until these technical problems have been resolved. New developments in the tire industry have consisted of changes in the tread to increase traction and decrease skidding, and in off-the-road tires for farm and earth-moving equipment.

In other automotive uses of rubber, Phoenix Gummiwerke has entered into production of air suspension springs while Continental is producing bellows for this type of unit. At present, more than five hundred different rubber parts are being installed in German medium-sized passenger cars. Five years ago such cars were equipped with only about three hundred accessory parts made of rubber according to a representative of Continental Gummi-Werke.

German Tire Makers Use Controls and Automation

Tire tread is checked as it emerges from the extruder at the Gummiwerke Fulda A.G. plant in West Germany.

Modern Processing Machinery

Germany is now, as it has been in the past, a leader in the field of instrumentation and automation. The Bunawerke Huels cold rubber plant, as well as some of the newer tire fabric coating trains, show this to be true in their fine-control systems and almost fully automatic operation.

In the field of heavy rubber processing equipment, German manufacturers take a back seat to none. Pioneers in the lines of internal mixers, mills, calenders, extruders and continuous vulcanizers, they are today regaining their rightful place in German factories as well as in the export field. At Berstorff in Hannover, as at other plants throughout Germany, they are producing some of the most modern equipment available anywhere in the world. Their AUMA machine, formerly known as the Berstorff Continuous Vulcanizing Machine, is being widely used throughout the Continent. The first of these "drum curing" units was produced in 1929 and, although over 135 units have been produced, only two have been exported to the United States, one to Boston Woven Hose and Rubber Co. in 1932 and the second to the Wooster Rubber Co. (now Rubbermaid) in 1953. Their two, three, and four-roll calenders are made with fine precision, automatic controls, and axis crossing features to compensate for roll deflection. A wide variety of extruders are also being produced for rubber and plastic extrusions including large vertical machines for film.

An operator relies on automatic controls prevalent in German plants for vulcanization of tires.

Evaluation of Rubber Compounds for Vibration Isolation at Elevated Temperatures

By R. RACCA and L. GAMMELL

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MB Electronics Co.,
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THE PHYSICAL properties of natural rubber have made it an ideal construction material for shock and vibration isolation mountings. However, current designs require environmental usage at higher temperatures for extended time intervals. Unfortunately, under these conditions, natural rubber undergoes thermal aging which robs it of its capability as a shock and vibration isolator.

A study was undertaken to evaluate the dynamic and static physical properties of the available elastomers at room temperature and elevated temperatures. The primary objective of the program was to determine which available rubber compound would be capable of withstanding an ambient temperature of 250°F. for 800 hours, without experiencing serious physical degradation. Such a compound would also have to possess physical properties approaching those of natural rubber in order to render it suitable for existing mount designs.

The test procedure developed for this work provides sufficient accuracy to detect slight changes in the physical properties of elastomers due to thermal degradation. Test theory employed is based on two opposing spring mass systems, each with a single degree of freedom. The nodal point between the systems simulates attachment to a structure of infinite rigidity. This approach eliminates the problem of differentiating between relative movement of the supporting fixture and test specimens. A force vector diagram of the test theory is shown in Figure 1. In practice, the frequency of the impressed force (F_o) is adjusted until resonance is obtained. At resonance, the impressed force is at a 90-degree phase shift from the displacement (X), and is opposed only by the damping force ($C\omega X$). Likewise at resonance, the inertia force ($M\omega^2X$) is opposed only by the spring force (KX). The resonance frequency is obtained precisely by varying the forcing frequency and observing the force displacement pattern on an oscilloscope. Resonance is indicated by a straight diagonal line on the oscilloscope screen.

Computing Force Vectors

All components of the force vector diagram are evaluated by initially computing values for the inertia force ($M\omega^2X$) and the exciting force (F_o) at resonant frequencies. The exciting force (F_o) is computed by multiplying the vibration exciter coil by the force/amp calibration of the exciter. The inertia force ($M\omega^2X$) is also readily obtained, since the equivalent moving mass (M), the force frequency ($\omega/2\pi$) and the vector displacement (X) are all measurable quantities.

Upon obtaining the exciting force (F_o) and the inertia force ($M\omega^2X$), the following properties and characteristics of each elastomer can be determined:

(1) Damping Force ($C\omega X$)

$$F_o = C\omega X$$

(2) Coefficient of Equivalent Viscous Damping (C)

$$C = F_o/\omega X$$

(3) Spring Force (K_dX)

$$K_dX = M\omega^2X$$

(4) Spring Rate (K_d)

$$K_d = \omega^2 m$$

(5) Transmissibility at Resonance (T.R.) =

$$\frac{\text{Transmitted Force}}{\text{Exciting Force}}$$

$$\text{T.R.} = \sqrt{\frac{(K_dX)^2 + (C\omega X)^2}{C\omega X}}$$

(6) Dynamic Stiffness or Modulus Ratio (Y)

$$Y = K_d/K_s$$

Standard bonded A.S.T.M. (D945-55) test specimens with modified adapter plates were used for dynamic testing throughout the program. The adapter plates were rigidly attached to test fixtures, and the specimens were excited either in shear or compression with a forced harmonic vibration. The specimens with the attached moving mass constituted the two spring systems, each with a single degree of freedom. A block diagram of the test setup is shown in Figure 2.

Since it was important that a single degree of freedom be maintained for each system, any motion of the test fixtures was observed with a stroboscope. In most instances extraneous motion was eliminated by minor adjustments of the fixture, but where instability could not be corrected, test data was omitted.

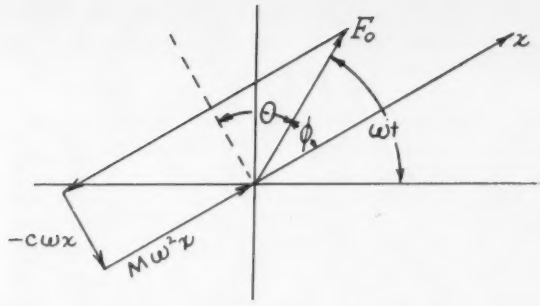


FIG. 1—Vector diagram of forced vibration with viscous damping, allowing a single degree of freedom.

Test Procedures

Four test specimens that were bonded simultaneously in the same mold were used to evaluate each rubber stock. The static compressive and shear spring constants were determined for each test specimen at deflections of .050, .100, .150, and .200 in. The specimen was preflexed to .250 in. three times and permitted to recover for one minute before testing. A one-minute delay was also allowed before reading the load at each deflection.

The four specimens were then mounted in the compression test fixture, and the fixture attached between two vibration exciters. The field current on each exciter was adjusted to the value determined by the force/amp calibration performed prior to starting the test. This assured equality of the opposing impressed forces. The amplifier output was maintained at a double amplitude displacement reading of .001 on the M-3 meter, while the oscillator dial was scanned to obtain the resonant condition.

The procedure was repeated with the same equivalent mass for double amplitudes of .003, .005, .007, .010, .020, .030 and .040. In general, as the vibration amplitude was increased, the resonance frequency of the system decreased.

The compression test fixture procedure was repeated for two sets of weights mounted rigidly on the moving element of the exciter. The weights were designed to increase the resonant frequency of the system by one-third and two-thirds the original values for a given amplitude. While remaining mounted in the test fixture, the temperature of the specimens was raised to 250°F. and held there for 30 minutes. The entire sequence was then repeated at the 250°F. ambient temperature.

Finally, the specimens were oven-aged at 250°F. After a predetermined period of aging, each group of specimens was removed from the oven, cooled and retested at room temperature following the sequence outlined above. Aging was then continued on each set of specimens until changes in physical properties marked them unsuitable for use as high temperature elastomers.

Data Accuracy

Reproducibility of test data was found to be satisfactory. This was shown in the testing of silicone rubber, where similar data was obtained after each period of aging. As expected, silicone showed no degradation on aging at 250°F. Other test results were also compared with previous data.

Values for a loss factor on nitrile and natural rubbers were given in a report entitled "A New Method for Determining the Dynamic Mechanical Properties of Rubber" in *Rubber Age*, February, 1956. The loss factor, which is a measure of the damping of an oscillating system, was comparable to the damping force/spring ratio evaluated in our tests. The loss factor for nitrile rubber (.40) was 2.8 times that of natural rubber (.14). This agreed with the value of 3.0 for the damping force/spring ratios of the two materials, obtained in our work.

Tests conducted in 1952 on an aircraft engine mount core No. MB-146815 found a damping force/spring value of 7.75% at 37 cps and a double amplitude displacement of .040 in. The damping force/spring force values for three sets of natural rubber samples tested under the same conditions was found to be 5.7%, 6.7% and 7.7%.

Thermal Aging

Natural rubber ages primarily through molecular chain breakage. It experiences internal softening and surface cracks; develops a brittle skin; and, as internal damping increases, becomes viscous. Serviceability was less than 300 hours at 250°F. and two hours at 400°F.

Nitrile and neoprene rubbers age primarily through increased molecular cross linkage, becoming hard and brittle, and experiencing only a slight increase in damping force/spring force ratio. Serviceability of test specimens ranged from 300 hours for neoprene to nearly 500 hours at 250°F. for nitrile.

Butyl rubber ages primarily through changes in molecular radical groups, becoming increasingly soft and gummy with increased damping. The serviceability of test specimens varied from less than 300

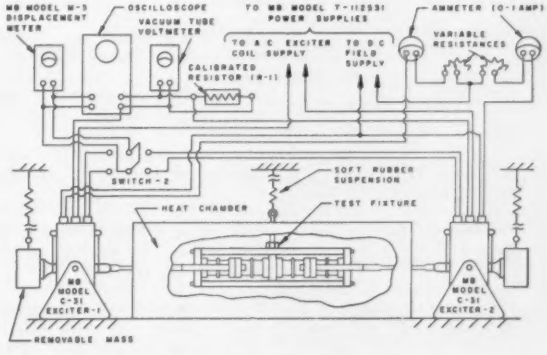


FIG. 2—Block diagram showing the two-spring system and other details of the complete test setup.

hours at 250°F. for Enjay Butyl 217, to over 1200 hours for brominated butyl.

Silicone and polyacrylic compounds were aged at 250°F. for 1200 hours. This period was insufficient to establish the aging characteristics of either material. Polyacrylic should experience the same type of aging as nitrile rubber.

General Results

Following is a summary of the information regarding high temperature elastomers that has been obtained from this test program:

(1) All synthetic elastomers and rubber blends have modulus ratios and damping characteristics that are higher than those of natural rubber at room temperature.

(2) Synthetic organic elastomers that heat-age satisfactorily have the highest modulus ratios and internal damping forces. At 250°F., the modulus ratios of these compounds are only slightly greater than that of natural rubber, and the damping force/spring force ratio decreases approximately 50% from room temperature values.

(3) Silicone rubber heat-ages well, and can be compounded to provide satisfactory dynamic properties. The static properties of this material are inferior to other rubber types at present.

(4) Silicone gum stock (DC-410) improves the dynamic properties of butyl compounds, resulting in a blend with lower tensile strength, increased elongation and decreased hardness.

(5) The addition of reinforcing agent or filters impairs the dynamic characteristics of rubber compounds. Detailed evaluation of all test specimens is given in the accompanying chart.

It is apparent, therefore, that the utilization of a synthetic elastomer in a vibration isolator requires special design considerations paying particular attention to such properties as a high modulus ratio, increased internal damping, and generally inferior creep characteristic under constant load.

Detailed Evaluation of Test Specimens

MATERIAL	CHARACTERISTICS
Natural Rubber No. 2 R.S.S.	Ideal physical properties before aging—low dynamic stiffness, low damping, high tensile strength and elongation; ages poorly at elevated temperature, satisfactory for high temperature application for short durations.
Nitrile (Hycar 1042)	Good static and fair dynamic physical properties; dynamic stiffness from 2 to 3, damping four times that of natural rubber, thermal aging approximately 60% better than natural rubber at 250°F.; static and dynamic spring rates increase upon aging.
Neoprene W	Static and dynamic properties generally inferior to natural rubber, hardness upon aging; service life at 250°F. temperature about 10% better than natural rubber.
Silicone SE-450	Poor static physical properties; dynamic properties approach natural rubber; dynamic stiffness 1.6; excellent thermal aging at 250°F.
Polyacrylic	Below average static properties, and extremely poor dynamic properties; dynamic stiffness exceeds 5; damping ten times that of natural rubber; good thermal aging at 250°F.
Blends of Natural and Nitrile Rubber	Static and dynamic properties of these blends are consistent with the percentages of rubber used. Consequently, no blend aged as well as 100% nitrile rubber.
Brominated Butyl	Fair static physical properties; dynamic stiffness from 4 to 5; damping seven times greater than that of natural rubber; maintains high damping at elevated temperatures; thermal aging characteristics are good at 250°F.
Neoprene WRT	Static and dynamic properties are similar to Neoprene W; aging characteristics are slightly inferior.
Enjay Butyl 325	Aging characteristics not determined, but are reported to be good. Static and dynamic properties similar to brominated butyl.
Enjay Butyl 217	Satisfactory static properties; dynamic stiffness at room temperature is only 1.6; damping is five times that of natural rubber; test specimens show serious degradation upon aging 300 hours at 250°F.
80% Enjay Butyl 217 20% Silicone DC-410 Gum	Presence of silicone did not appreciably improve aging characteristics of the compound.
Reinforced Enjay Butyl 217	Additional carbon black was added to Enjay Butyl 217 to increase hardness from 31 to 54 durometers. This resulted in inferior dynamic properties and superior aging characteristics after the addition was made.
90% Brominated Butyl 10% Silicone DC-410 Gum	Dynamic properties are better and static properties slightly inferior to brominated butyl. Modulus ratio is lower and more constant than, and damping characteristics and aging properties are equivalent to the pure brominated butyl.

An operator at the Corduroy plant bolts a tire mold down for cleaning operation, having lifted it into position with a chain hoist.

How Wet Blasting Is Used for

Cleaning Aluminum Tire Molds

By L. D. STEVENS
Factory Manager, Techline Division, Wheelabrator Corp., Vicksburg, Mich.

THE TIRE industry recently found that an aluminum mold was the answer to the manufacture of today's tires which incorporate more and finer sipes. Aluminum has also proved to be a superior, faster and more economical type of mold to make. This mold with the steel outer shell, aluminum core and steel inner liner, however, was the beginning of a production headache for the Corduroy Rubber Company, Grand Rapids, Mich. The company had to find a new method of cleaning these molds.

The former all-steel molds had been cleaned by flame torches and wire brushes. Heat from the cleaning torch did not affect the dimensional tolerances of the molds made of hard steel. Since the aluminum molds, though, were softer than the steel ones, they would not withstand the heat of flame cleaning. The shape of the mold would become distorted.

A method had to be found for removing contaminants—charred rubber, residue of mold lubricants, talc, soap stone, etc.—that accumulate after each heat. After about 500 tires have been formed in a mold, this deposit must be removed or it will interfere with the removal of the tire from the mold and affect the pattern of the tread dimensionally.

Corduroy Rubber selected a Liquamatte wet blasting machine made by Techline Division of Wheelabrator Corp., Vicksburg, Mich., for cleaning the new type tire molds. This machine is equipped with a revolving turn-table work platform, onto which the mold is bolted for cleaning. The turn-table is tilted approximately 45 degrees to facilitate loading and unloading, and to expose more crevices in the tire pattern to the direct force of the blast. The operator controls the revolution of the turn-table by a pedal control.

In the Liquamatte, a mixture of very fine glass bead abrasive material (Liquasheen 230) and water is ejected from a nozzle at a high velocity. This nozzle is designed so that the slurry is accelerated by air pressure as it leaves the tip. Surface abrasion is easily controlled by the size of the abrasive grains, their concentration and velocity. At Corduroy, 200-300 pounds of abrasive are used per month.

When cleaning is necessary, the tire molds are transferred from the press to a portable dolly and moved to the wet blasting machine where they are lifted into position by an overhead chain hoist. Average tire mold cleaning time ranges from 30 minutes to one hour per side, depending upon the degree of contamination and the complexity of the mold pattern. This is slightly longer than the time formerly required by the manual operations on the all-steel molds, and extra handling is required to remove the mold from the press. The Liquamatte, however, provides an efficient and economical means of cleaning aluminum molds which would be extremely difficult and costly to clean by any other method, the company states.

Although Corduroy Rubber installed the blasting machine primarily for cleaning tire molds, it has proved useful in cleaning many of their mechanical product molds as well. Cleaning these smaller molds in an alkali bath leaves a slight film which interferes with the first few cures and makes the part adhere to the mold, particularly when forming parts with colored rubber. Wet blasting is now used to clean this film from such mechanical molds.

Maintenance on the Liquamatte has been negligible. There have been no breakdowns since it was installed; only routine maintenance and inspection have been needed. The mold cleaner, who operates the machine, checks and washes the filters and maintains the slurry at the proper level and consistency.

EDITORIAL

Oh I Wish I Were in Dixie

► Judging by recent developments, the rubber industry of the South and Southwest is experiencing a new vitality and growth which bodes well for the rubber industry as a whole. It should be noted that three new tire manufacturing plants are now under construction in this area as well as several tread rubber, mechanical goods and masterbatch plants. For example, General Tire is constructing a new tire plant at Mansfield, Ky.; Mansfield is constructing a new tire plant at Tupelo, Miss., and Gates is putting up still another tire plant at Nashville, Tenn.

The fact that the South and Southwest are experiencing an industrial renaissance, in general, is contributing in no small measure to the heightened activity in rubber goods manufacture. Increased industrial activity brings with it greater economic strength—a greater labor force—more roads—more schools—more of everything. The per capita consumption of rubber increases, and people begin to look for local sources of supply. Where better to locate a new rubber goods plant? Where better to locate new sales offices, warehouses, chemical concerns, etc.?

Since the end of World War II, the rubber goods manufacturing industry of the South and Southwest have been making tremendous strides. Look at what has been happening: The 1949 RUBBER RED BOOK listed two rubber manufacturing installations in Georgia—the 1959 RUBBER RED BOOK lists *thirty*. The 1949 RUBBER REDBOOK shows *no* rubber goods plants in South Carolina—the 1959 edition lists *nine*. The 1949 edition lists fourteen rubber goods plants in Texas—the 1959 edition shows *forty-two*. And so it goes.

It seems to us that while many American companies are complaining about the loss of foreign markets they are overlooking many opportunities within our own borders. Opportunities for growth still exist within the United States. Our population, now close to 180 million, is expected to reach 200 million by 1980. Our per capita consumption of rubber, now near 20 pounds, may well reach a 21 or 22 pound level by 1980. And many of the new rubber goods manufacturing plants which will make all this possible may well be located in the South and Southwest.

A good case can also be made for the mountain states and North and South Dakota are still to be heard from. Who will operate the first rubber goods plant in Hawaii? In Alaska? But at the moment, it is the South where "things are going on." If Horace Greeley were here today, might he not recommend "go SOUTH young man"?

Special Industry Report

Reducing the Risks of

Developing New Rubber Products

Although the accompanying discussion is concerned with the proper launching of new products, it should also be pertinent to consider the sources of the ideas behind these products. How does a company go about getting good suggestions for exciting innovations? Ideas arise in minds—the minds, not of groups, but of individuals. When it comes time to follow the proverbial 5 percent of inventive inspiration with the 95 percent of perspiration, the procedures recommended below give good results with a team effort, but before this time, when the idea is the thing, it is best to consider the psychology of the individual.

There is really not much to be said about the idea man himself, other than listing such typical attributes as technical curiosity, inventive talent and rapport with his subject. On occasion, the ambition and energy of young junior executives have served to overcome lack of talent. In any case, the study of inventive genius admittedly is more a proper subject for journals of psychology and philosophy than for RUBBER AGE, but one aspect of the subject is most certainly proper for consideration here. This is the question of personnel environment: what is the best climate for new ideas?

There are in existence companies who operate on a top secret basis where communication between upper level management and the technical staff is practically non-existent and definitely unencouraged. This is indeed arid ground in which to expect new ideas to sprout and flourish.

Thus, we can list communication and recognition in decision making for technical personnel by management as the first requisites of creating a good idea climate. Add to this some more tangible elements such as an absence of picayune rules, a goodly measure of autonomy for qualified researchers, and substantial rewards for promising results. Finally, if there also exists over all a sort of esprit de corps between management and staff, we begin to attain a truly salubrious climate for creative technical thought.

NEW PRODUCTS are splendid. They can make arresting reading in an annual report, they can bring prestige to the president, supply stimulating topics for the sales manager and provide profits for the controller. But they can also be a disaster, a source of embarrassment to management, rejected merchandise for sales and red ink on the ledgers. Unfortunately, the unpleasant happenings occur more often than the pleasant ones when a new product is launched.

The editors of RUBBER AGE, realizing the dangers involved in the launching of a new product, approached Norman Hewitt, Rubber Technologist in Charge of Elastomer Section, Foster D. Snell, Inc., New York City, for his ideas on this problem as related to the rubber industry. His firm specializes in product research and development, application, improvement and evaluation; and also handles market research, toxicology and engineering studies. In this article he enumerates and illustrates some of the unpleasant things which may happen to a new elastomer product on its launching.

Enlightening subdivisions of any new product campaign can be made on the basis of time and function. In these terms we can outline the life of a new product as follows:

Time
Before manufacture
During manufacture
After manufacture
Function
Market research
Processing methods and quality control
Performance and marketing

The operations of most rubber companies are carried out by four major operating divisions: sales, manufacturing, technical (or R & D) and finance. Among these divisions we can allot the functions of the market to sales and market research, processing to manufacturing and R & D, and product performance to R & D alone.

R & D is, of course, Research & Development. Other agencies are involved but the major responsibility for success or failure lies with this group. This is still true whether the new idea and its development comes from a consultant or from a company's own research division. In either case, the rubber industry has for many years given the R & D function a strong enough voice in management so that it enjoys a remarkably sound position from

Market research and quality control in manufacturing can turn the gamble of launching a new rubber product into a calculated risk with the odds on your side.

which new products can arise with no undue organization strains. Thus, at the very outset we can list lack of sound technical direction—or, worse, lack of management recognition for the technical operation—as an unhealthy atmosphere in which to start a new product.

Where to Begin

The proper starting point for a study of pitfalls is that time before manufacture when the decision to launch a new product has still to be made. This is the time for market research. Is there a market of any kind for the new product? At this time or later? What will be the effect of future competition? In one actual case this latter question meant a decision to forego the proposed new product when it was found that within two years foreign competition would force the price below the estimated break-even point.

Questions regarding the per cent of the total market available or the distribution of the market by geography, consumer type or season usually are best settled by extensive surveys. Other questions can be answered by a few inquiries and discussion among a company's best customers and their salesmen. In any case, some kind of market study is essential. It can be embarrassing to find oneself with a shiny new product and no place to sell it.

Processing

The maiden voyage of a new product through the manufacturing operation will even under the fairest circumstances contain some rough moments. Generally the trouble arises from a failure to treat the new product with sufficient respect for its newness.

In the rubber industry's early experiences with synthetics, much defective production appeared as the direct result of trying to process styrene rubber, butyl rubber or neoprene in just the same way that natural rubber had been treated for so long. Of course, the suppliers' literature always states that conventional rubber machinery can be used. This is true, but it is just as true that it cannot be used in the conventional manner. All rubber chemists are familiar with the marked differences in tack, cohesive strength and rheological properties which must be dealt with.

We recall one instance where master tank liners were producing butyl rubber-lined chemical process equipment which, after vulcanization, had a remarkably fine crop of blisters and open seams. These fellows either had forgotten or never were told that making rubber to rubber seams with a synthetic is a tightrope-walking operation where too little adhesive won't hold and too much leaves trapped solvent. Of the two possibilities, it is more likely that they weren't properly educated by management. The best way to gain the needed respect for a new product in manufacturing is to emphasize its newness by devoting extra time and money for instruction and education for the people who make it.

This example, like most of those in the rubber industry, is based on products which are new because they're made with new raw materials rather than made for new purposes. This is in no way a reflection on the state of progress in rubber research and development; quite the reverse is the case. A list of inventions, starting with the lead pencil and finishing with the space satellite, which have profited from innovations in rubber technology can easily be made. Thus it is more illuminating to say that innovation in the rubber industry often takes the form of new performance rather than new products.

Post-Manufacturing Risks

These considerations lead logically to the post-manufacturing risks in introducing a new and improved rubber product. Here the major source of trouble is the risk of incomplete evaluation. When a new product is launched without adequate knowledge of its basic physical and chemical properties trouble is sure to follow.

A look at illustrative case histories reveals frequent mention of the word compatibility. The mixtures of compounding chemicals in elastomer and plastic formulas often contain some strange bedfellows. Of course, they got there by design, but it was a design that concentrated on one desirable property, say a reduction in material cost of ¼-cent, to the exclusion of others such as compatibility.

One classic example involved a foil-to-cork bottle cap adhesive. It took several months for the incompatibility of one of the resin components to develop, but when it did the foil discs fell like autumn leaves. In other fields the inadequate experimental evaluation of low-temperature behavior has cost dearly. Synthetic tires, particularly those on World War II military vehicles, showed strange and unsuspected behavior at arctic and Russian winter temperatures. In this case, the results of inadequate testing went somewhat further than decreasing the dividend of rubber corporation stockholders.

Another Source of Trouble

Migration is another phenomenon which has commonly spelled trouble in the performance of a new product. In rubber compounds the most common manifestation is bloom, a colorful phrase meaning migration of partially-soluble curing agents or antioxidants to the surface of a vulcanizate. When this surface is in contact with another material the migrating chemicals keep right on moving. The result is often staining or discoloration in the contiguous surface.

This type of behavior which a few years back furnished enough trouble-shooting work to keep a consultant comfortably busy is generally found in those composite products made from both rubber and plastics. Sulfur from the rubber compound combines with lead in the plastic's stabilizer to produce dark stains on pastel surfaces. Another variation of the migration pitfall comes from the staining type of antioxidants. In one such case army aircraft instrument panels exhibited a completely unauthorized luminous halo in the area around neoprene light trap gaskets. Once the antioxidant was changed the trouble disappeared.

All of these failures could have been avoided by a complete evaluation of performance requirements before pronouncing the product fit for service. Even if one is not prescient enough to foresee the exact trouble he can still protect himself by selecting accelerated test procedures which will reveal unsuspected dangers. Although the laboratory is the place to find out about product failures even a test marketing is preferable to the blind release of a new and untried product to an unknowing public.

The risks of innovation are indeed great. But they can be circumvented. If the market has been properly assessed, the manufacture strictly controlled, and the properties and performance thoroughly tested a new product is well assured of a successful launching and a prosperous voyage.

Attorney General Reports On Status of Synthetic Industry

► In his fourth annual report on the status of the synthetic rubber industry, the Attorney General of the United States notes that smaller companies in the synthetic rubber industry "evidenced real competitive strength" in the face of lowered demand in 1958. In general, the Attorney General reported, the smaller companies more than held their own with the larger concerns in the field in obtaining a share of diminishing markets.

As a result of the business decline in 1958, styrene rubber producers operated their plants at 62.6 per cent of capacity compared to 66.2 per cent in the previous year. However, the production cutback during an existing buyers' market had no serious effect on any company's ability to compete, the Attorney General declared.

Butadiene producers, on the other hand, did not do so well. As demand slackened, integrated styrene rubber producers used butadiene from captive plants. Independent styrene rubber producers restricted butadiene purchases to plant located near their manufacturing installations. As a result, the market for butadiene contracted sharply.

Cites Buyers' Market

The Attorney General noted that one effect of the recession in 1958 was to intensify the buyers' market for styrene rubber. Competition stiffened among styrene rubber producers in providing improved quality rubber, better packaging and more technical service.

For the first time since the survey began, there were no complaints of shortages of synthetic rubber of any type. All companies queried believed that they had been able to obtain a fair share of synthetic rubber at a fair price.

Another bright spot is the increased number of new rubber types. The biggest increase is in the number of black masterbatches and oil-black masterbatches. The increase in number of types tends to break up the pattern of plant specialization inherited from the days of government operation. For example, in 1957 only three producers offered a cold rubber oil-black masterbatch. Last year, all but two of the major producers were offering this type.

In taking note of the European market for various types of synthetic rub-

Table I—Synthetic Rubber In 1958

Company	*Plant Location*
S-Type Rubber Plants	
American Synthetic Rubber Corp.	Louisville, Ky.
Copolymer Rubber and Chemical Corp.	Baton Rouge, La.
Dewey & Almy Chemical Div., W. R. Grace & Co.	Cambridge, Mass.
Firestone Tire & Rubber Co.	Akron, Ohio; Lake Charles, La.
General Tire & Rubber Co.	Odessa, Texas
Goodrich-Gulf Chemicals, Inc.	Port Neches, Texas; Institute, W. Va.
Goodyear Tire & Rubber Co.	Akron, Ohio; Houston, Texas
International Latex Corp.	Dover, Del.
Phillips Chemical Co.	Borger, Texas
Shell Chemical Corp.	Los Angeles, Calif.
Texas-U. S. Chemical Co.	Port Neches, Texas
United Rubber & Chemical Co.	Baytown, Texas
United States Rubber Co.	Naugatuck, Conn.
Butyl Rubber Plants	
Esso Standard Oil Co.	Baton Rouge, La.
Humble Oil & Refining Co.	Baytown, Texas
Neoprene Rubber Plants	
E. I. du Pont de Nemours & Co.	Montague, Mich.; Louisville, Ky.
N-Type Rubber Plants	
Firestone Tire & Rubber Co.	Pottstown, Penna.
B. F. Goodrich Co.	Akron, Ohio; Louisville, Ky.
Goodyear Tire & Rubber Co.	Akron, Ohio
International Latex Corp.	Dover, Del.
United States Rubber Co.	Baton Rouge, La.
Butadiene Plants	
Copolymer Rubber & Chemical Corp.	Baton Rouge, La.
Dow Chemical Co.	Freeport, Texas
Esso Standard Oil Co.	Baton Rouge, La.
Firestone Tire & Rubber Co.	Orange, Texas
Goodrich-Gulf Chemicals Co.	Port Neches, Texas
Humble Oil & Refining Co.	Baytown, Texas
Odessa Butadiene Co.	Odessa, Texas
Petroleum Chemicals, Inc.	Lake Charles, La.
Petro-Tex Chemical Corp.	Houston, Texas
Phillips Chemical Co.	Borger, Texas
Shell Chemical Corp.	Torrance, Calif.
Standard Oil Co. of California	El Segundo, Calif.
Texas Butadiene and Chemical Corp.	Channelview, Texas
Texas-U. S. Chemical Co.	Port Neches, Texas
Union Carbide Corp.	Charleston, W. Va.; Texas City, Texas; Seadrift, Texas
Styrene Plants	
Cosden Petroleum Corp.	Big Springs, Texas
Dow Chemical Co.	Freeport, Texas
Foster Grant Co., Inc.	Baton Rouge, La.
Koppers Co., Inc.	Kobuta, Penna.
Monsanto Chemical Co.	Texas City, Texas; Springfield, Mass.
Odessa Styrene Co.	Odessa, Texas
Shell Chemical Corp.	Los Angeles, Calif.
Union Carbide Corp.	Institute, W. Va.

ber, vastly expanded since 1955, the Attorney General foresees a progressive shrinkage as substantial new foreign capacity for these materials comes on stream.

"The export market in the future may well be seriously affected by the output of foreign plants already in being and those planned for operation in the next few years," the report says. Cited, for example, was the action of England, Germany and Italy in bringing into production in 1958 plants capable of ultimately producing an estimated 305,000 tons of synthetic rubber annually.

The report said further that "a number of other foreign plants are scheduled for operation in 1959 and the following years." Reference here included Europe's first, 20,000 ton-a-year butyl facility in France; two plants slated to begin production of S-type rubber and Hycar. "Additional production of general purpose and specialty rubbers is expected in 1960," the report said. It noted that the Japan Synthetic Rubber Co. will open an S-type rubber facility capable of producing 45,000 tons annually within five years. It noted also that DuPont will bring a 22,000 ton neoprene plant into production in Ireland in 1960, along with a new N-type plant of unstated capacity, near Paris.

The report lists three other facilities as scheduled for operations in 1961; a 50,000 ton S-type plant near Marseilles; a 20,000 to 30,000 ton plant at Bareilly, India; a 40,000 ton S-type plant near Buenos Aires and an S-type plant of unstated capacity near Melbourne, Australia. Listed also are a number of other plants of substantial capacities projected or under consideration, but for which no completion dates have been announced.

The Attorney General said "Research continued to play an important part in industry activity during 1958 and early 1959," and cited specific developments and expansions by various companies in connection with processing and products themselves.

He took special note of the fact that a number of companies "have continued development work on the new synthetic rubbers, polybutadiene and polyisoprene. Polyisoprene is almost a chemical duplicate of natural rubber and would be a complete substitute for it," the report said.

"Commercial development of polyisoprene," the Attorney General hailed as "an important aid to national defense. Its availability in sufficient quantity will free the United States completely from dependence on foreign sources of natural rubber in time of emergency. In the commercial field, its presence on the market should have a stabilizing effect on the traditionally fluctuating natural rubber prices."

The Attorney General discerned no basic changes in the competitive patterns within the industry and noted that there was no change in the basic price structure on domestic sales in 1958. He did say, however, that apart from prices, "competition has been intensive in providing technical services for customers and in proliferation of new rubber grades, particularly in oil masterbatches.

"Between May 1956 and May 1958 the number of types and packages marketed by all S-type producers has increased from 252 to 433. As of December 1958 seven major S-type producers were offering a total of 62 black or oil black masterbatches alone and the number has increased considerably.

"The growing multiplicity of available grades running the gamut of possible compositions amounts in itself," the Attorney General said, "to a form of price reduction because the economies of extending the net polymer with oil and loading it with carbon black make possible the marketing of these grades at prices substantially below those of standard, unpigmented polymers. In addition, the range of com-

Table II—S-Type Rubber Capacity by Company, 1955, 1957-59

(Thousands of long tons)

Company	*May 1, 1955*	*Dec. 31, 1957*	*Dec. 31, 1958*	*Anticipated Capacity Dec. 31, 1959*
Goodyear	146.5	255.6	255.6	255.6
Firestone	129.6	231.1	231.5	231.5
Goodrich-Gulf	95.0	232.0	247.0	274.0
Shell	94.0	126.0	126.0	126.0
Texas-U. S.	88.0	127.0	127.0	127.0
Phillips	69.4	111.0	118.0	118.0
United Rubber	62.0	69.8	69.8	69.8
Copolymer	49.0	75.0	75.0	95.0
A. S. R. C.	44.0	68.5	68.5	68.5
U. S. Rubber	22.2	30.0	30.0	32.0
General	....	40.0	40.0	40.0
All other	....	5.3	7.7	16.6
Total	799.7	1,371.3	1,396.1	1,454.0

Table III—Market Position of S-Type Rubber Producers, 1955, 1957-58

	Percentage of Capacity			*Percentage of Production May-December*			*Percentage of Domestic Sales May-December*		
Company	*May 1, 1955*	*Dec. 31, 1957*	*Dec. 31, 1958*	*1955*	*1957*	*1958*	*1955*	*1957*	*1958*
Goodyear	18.3	18.6	18.3	17.7	24.2	24.1	23.0	23.1	22.2
Firestone	16.2	16.8	16.5	19.1	20.6	19.4	19.9	19.1	18.3
Goodrich-Gulf	11.9	16.9	17.7	12.7	13.9	12.2	10.3	12.1	11.2
Shell	11.7	9.2	9.0	10.2	7.7	6.3	10.6	8.5	6.9
Texas-U. S.	11.0	9.3	9.1	12.0	7.0	9.2	10.4	9.2	10.3
Phillips	8.7	8.1	8.5	7.1	8.3	8.1	8.0	8.3	7.0
United Rubber	7.8	5.1	5.0	3.7	4.4	4.2	5.0	6.2	6.7
Copolymer	6.1	5.5	5.4	6.4	7.1	6.6	5.6	7.2	7.9
A. S. R. C.	5.5	5.0	4.9	6.6	4.0	4.4	5.3	3.7	4.6
U. S. Rubber	2.8	2.2	2.1	2.6	2.4	2.2	1.9	2.5	2.3
General	——	2.9	2.9	——	.3	3.1	——	.1	2.4
All others	——	.4	.6	1.9	.1	.2	——	——	.2
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

pounds now available to the fabricator often provides a product tailor-made for his process and tends to eliminate the compounding problems which are time-consuming, messy and expensive for him."

In a concluding reference to the ability of small business to cover its requirements, the Attorney General said: "In any event, small business fabricators in our survey expressed satisfaction over their treatment and the competition for their business. Of course, the existence of a strong buyers' market in the last two years has obviated any consideration of possible small business treatment in a different business climate. There is as yet no indication of how small fabricators might fare in this industry with its close ties to the Big Five tire companies, should rubber demand overtake or surpass productive capacity for the industry."

Ruberoid Plans Merger

► Ruberoid Co., New York, N. Y., and the Mastic Tile Corp., Newburgh, N. Y., have signed a memorandum of intent whereby Ruberoid will acquire the net assets and business of Mastic Tile through the exchange of Ruberoid capital stock. A final agreement will be submitted for approval to the board of directors and stockholders of each company at an early date. Included in the proposed transaction is Mastic Tile's interest in Cumberland Chemical Corp., formed last September and jointly owned by Mastic Tile and Air Reduction, Inc., which is constructing a plant at Calvert City, Ky., adjacent to other facilities of Air Reduction, for the production of various vinyl resins for use by Mastic Tile. Mastic Tile will be operated as a Ruberoid division, under the direction of Seymour Milstein and Harry C. Hackmeister, president and executive vice-president respectively.

Jaypen Sues Albert

► A $300,000 breach of contract suit against Sydney L. Albert and the Bellanca Corp. has been settled for $20,000 in U. S. District Court in Newark, N. J. Jaypen, Ltd., Toronto, Canada, sued over a trade of stock which took place in 1955. According to Jaypen, it received 15,000 shares of Bellanca stock in return for 325,000 shares of stock in Glenn Uranium Co. with an option to sell back the Bellanca stock for $20 a share within a year. Shortly afterwards, Bellanca ran into trouble with the Securities and Exchange Commission and was reorganized, with Mr. Albert out. Bellanca stock prices dropped. Jaypen said that when it tried to sell the stock back, Bellanca and Albert refused to buy. The settlement was made by Bellanca to Jaypen, Mr. Albert said. He described it as a "contingent liability" dating back to the Bellanca reorganization.

Scarito

Hahn

Kancylarz

Bohn

Cary Chemicals Names Four

► Cary Chemicals, Inc., East Brunswick, N. J., has announced the appointment of Philip R. Scarito as vice-president in charge of compounding and calendering; James C. Hahn as vice-president in charge of its Polymer Division; John C. Kancylarz as assistant vice-president of public relations and personnel; and Raymond R. Bohn, Jr., as works manager for its Flemington, N. J., plant.

Mr. Scarito is a graduate of Massachusetts Institute of Technology. Before he joined Cary Chemicals in 1957 as works manager, he was with Acme-Hamilton Mfg. Co., and Thermoid Co. Mr. Hahn is a graduate of Ohio State University. Prior to joining Cary Chemicals, he was with Goodyear Tire & Rubber Co., in charge of production management at the firm's Niagara Falls, N. Y., plant.

Mr. Kancylarz, a graduate of Fairleigh Dickinson University, has been with Cary Chemicals since the company was founded. His duties included service as assistant treasurer, office manager, purchasing agent, traffic manager, and supervisor of the Shipping Department. Mr. Bohn, a graduate of the University of Michigan, joined Cary Chemicals in 1957. He previously was with Monsanto Chemical Co., Merck & Co., and Standard Brands, Inc.

Exchange Industrial Information

► Frank Remmes, sales manager for the Randolph Machine Co., Randolph, Mass., exclusive North American representative of the Goliath Machine and Lasts Co., Jarrestad, Sweden, has flown to that country to represent Randolph Machine at one of the first exchanges of industrial information in the shoe industry. Carl Davison, president of Skolast Co., in cooperation with the Swedish government, will serve as host to the industrial delegations from many foreign countries including the Soviet Union. Mr. Remmes was an officer in the U. S. Army Quarter Master Department during World War II. At this time, he purchased rubber footwear, on behalf of the Allies.

Goodrich to Develop Rocket Fuel

► Wright Air Development Center at Wright-Patterson Air Force Base has awarded a contract to the B. F. Goodrich Co., Akron, Ohio, for the development of a higher thrust solid fuel rocket propellant. The propellant is to be especially designed to allow for greater safety in shipment of fuel. Development efforts will be conducted at the company's Research Center at Brecksville, Ohio and at its rocket fuel plant in Rialto, Calif., according to Goodrich.

Amoco Names Two

► Robert E. Elliott and William A. Hubbard have been appointed to two newly created positions within the Marketing Department of Amoco Chemicals Corp., Chicago, Ill. Mr. Elliott, formerly Chicago district manager, was named manager of industrial chemicals services and Mr. Hubbard, former assistant to the general sales manager, was appointed manager of industrial chemicals sales. A graduate of the Harvard Graduate School of Business Administration and the Missouri School of Mines, Mr. Hubbard is a member of the Chicago Paint and Varnish Production Club. Previously he served as president of Copolymer Chemicals, Inc., Livonia, Mich. Mr. Elliott was a salesman for Indoil Chemical Co. prior to joining Amoco Chemicals at the time of its formation two and a half years ago.

Phillips Takes Land Option

► Phillips Petroleum Co., Bartlesville, Okla., reports that it has taken an option on several tracts of land located approximately 100 miles from Houston, Texas. According to the report, the land may be used for the construction of a multimillion dollar carbon black plant. The exact location of the land was not disclosed.

Program Announced For Eighth Wire and Cable Symposium

► The Eighth Annual Symposium on "Technical Progress in Communication Wires and Cables," jointly sponsored by the U. S. Army Signal Research and Development Laboratory, Ft. Monmouth, N. J., and the wire and cable industry, will be held on December 1, 2, and 3, at the Berkeley-Carteret Hotel in Asbury Park, N. J. The three-day program begins at 9:30 on Tuesday morning, December 3, with H. L. Wuerth (Goodrich Chemical) serving as chairman of the first technical session. After a welcoming address by Col. H. McD. Brown, commanding officer of the Army laboratory, the following papers will be presented:

Ribbon Cable for Use at High Temperatures, by W. L. Gore (Gore & Associates).

Plastic — Insulated Ribbon — Cable for Switchboard Wiring, by F. Cools, H. Moons and J. Wuyts (Bell Telephone Mfg., Belgium).

Development of Semi-Air Spaced Coaxial Cable for 300°C. and 500°C., by S. W. Trill and A. L. McKean (Phelps Dodge Copper).

Ditridecyl Phthalate (DTDP) in High Temperature Vinyl Insulation, by W. A. Dimler, Jr. (Enjay Labs.).

The second technical session begins at 2:00 on Tuesday afternoon with J. L. Robb (Superior Cable) serving as chairman. The papers to be presented during this session include:

Color Standards for Plastic Insulated Communication Conductors, by W. W. Newman Jr., and C. R. Ballard (U. S. Department of Agriculture).

Scope of IPCEA Standards for Polyethylene Insulated Thermoplastic Jacketed Communication Cables, by J. V. McBride (Plastic Wire & Cable).

Determination of the Coefficient of Linear Expansion with Temperature of Cable Structures, by J. H. Shuhart and K. J. Dahms (Bell Telephone Labs.).

Cable Sheaths and Water Permeability, by G. F. Todd (Collyer Insulated Wire).

Crosstalk in Tactical Intra-Area Ground Electronic Cable, by E. Godwin (USASRDL), K. Okomoto and D. Botticello (RCA Service).

Design and Application of Missile Cables Employing Rubber Latex Insulation, by W. K. Priestley, C. J. Tappero and E. J. D'Aquanno (Kaiser Aluminum & Chemical).

C. T. Wyman (Bell Telephone Labs.) will serve as chairman of the third technical session which will begin at 9:15 on Wednesday morning. The following papers are scheduled to be presented at this session:

Automatic Conveyor for Polyethylene Granules, by J. F. Sheehan, Jr., G. A. Quick, Jr., and H. H. Burroughs (Western Electric).

The Problem of Drying Polyethylene Sheathing Compound Prior to Extrusion, by F. H. Kruger (Western Electric).

The Systematic Control of Rubber-to-Metal Adhesion in Wire and Cable Manufacture, by R. P. Stout (Hughson Chemical).

The Design of Dies for High Speed Wire Coating, by L. R. Hammon (Eastman Chemical).

A Novel Method of Core Screening Polyethylene Insulated Cables, by R. S. Stevens and A. Tomica (Standard Telephones and Cables, England).

The fourth technical session will begin at 2:00 on Wednesday afternoon with I. T. Stoneback (ITT Labs.) serving as chairman. The papers to be presented are:

Dependence of Photolytic Degradation of Polyethylene on the Degree of Dispersion of Carbon Black, by V. L. Lanza, J. H. Heiss and W. M. Martin (Bell Telephone Labs.).

Ethylene Copolymer for Wire Coating, by P. J. Boeke, T. E. Branscum and R. F. Craig (Phillips Chemical).

New Insulation Applications for High Density Polyethylene and Polypropylene, by W. P. Acton and L. C. Petzold (Hercules Powder).

Filler Study in Cross-Linked Polyethylene, by B. C. Carlson (R. T. Vanderbilt).

An Evaluation of Heat Stabilized, Flame-Retarded, Cross-Linked Polyolefins for Electronic Wire and Cable Applications, by P. M. Cook, R. W. Muchmore and H. Rapp (Raytherm Corp.).

Nylon 6 for Wire Jacketing, by C. W. Taylor (Spenser Chemical).

The fifth and final technical session will begin at 9:15 on Thursday morning. Chairman of this session will be B. Levinson (Okonite Co.). The papers to be presented are:

Use and Abuse of Plastic Insulation and Jackets, by B. Kellam (Hydro-Electric Power Commission of Ontario).

Thermal Aging Characteristics of Aircraft Wires and Cables, by E. L. Brancato and F. J. Campbell (U. S. Naval Research Laboratory).

Experimental Results on Cellular Dielectrics for Tele-Communication Cables, by R. Monelli (Pirelli, Italy).

Theoretical Consideration of the Stiffness of an Electrical Cable, by V. L. Carney and E. W. MacLaren (RCA Service).

Pawling Rubber Grants License

► Pawling Rubber Corp., Pawling, N. Y., has granted a license to Griffith Rubber Mills, Portland, Ore., to manufacture its building construction and consumer rubber products for distribution on the West Coast. The agreement further provides that the Pawling grants to Griffith the exclusive right to produce Pawling's patented extruded rubber products. The licensing agreement further provides that the Pawling organization will supply Griffith with complete technical and engineering assistance to develop production processes and to meet the requirements of new Griffith expansion plans.

Goodrich Builds Tire Test Track

► An approximately mile-long tire test track has been opened by B. F. Goodrich Co., Akron, Ohio, on a site adjoining the company's research center in Brecksville, Ohio. The track contains a series of flat curves, road bumps and sharp "S" turns that are designed to provide ideal conditions for studying the ride quality, steering, skid resistance and noise of experimental tire designs. Formerly, tests of this type were carried out on the highway and city streets, but it is expected that the new track will provide better test conditions by providing improved control of experimental factors.

Silicone-Treated Release Paper

► Crocker, Burbank Papers, Inc., Fitchburg, Mass., has developed a new silicone-treated release paper for use as a wrap or carrier in the rubber industry, which is said to have high tensile and high heat resistance. Designated Stick-Not, the new release paper provides the needed characteristics as a carrier for calendered and unvulcanized rubber because it has a minimum stretch along with high tensile and tear, the company states. It is also reported that Stick-Not is well suited for packaging sticky products such as camel back, unvulcanized rubber and hot melts. Its uniform, smooth coating, with resulting lack of picking, is said to make it ideal as an interleaf for rubber blankets, tape rolls, rubber heels and similar materials. The product is produced in rolls 83 inches wide and in weights of 30 to 80 pounds.

Offers Polyethylene Sheeting

► The production of heavy-gage, seamless, wide-width polyethylene sheeting is announced by Gering Plastics Division of the Studebaker-Packard Corp., Kenilworth, N. J. Marketed under the designation Ger-Pak, the sheeting is available in thicknesses up to 15 mils and in widths of 20, 28, and 32 feet. Offered in black and natural-clear, it is shipped in gusseted rolls.

Plas-Tech Equipment Opens New Research Center

► Two testing machines designed for measuring the performance of rubber and plastics under high rates of stress application were demonstrated by Plas-Tech Equipment Corp. at the opening of its new Plastics-Research Center in Natick, Mass., on October 20. Melvin Silberberg, president of Plas-Tech, stated that until now it has been possible to measure the effect of slowly applied stresses. However, many materials behave very differently when the stresses are applied rapidly. Mr. Silberberg explained that with Plas-Tech's Plastechon High-Speed Universal Tester, one can obtain a photographic record of stress-time or stress-strain phenomena for ultimate strength tests in which the specimen is stressed to failure in a few thousandths of a second. This means, Mr. Silberberg stated, that by testing a small sample in the laboratory, both the producer of raw materials and the manufacturer who uses them in civilian or military applications can tell how the end product will stand up in service. Mr. Silberberg reports that applications for the Plastechon tester go beyond the rubber and plastics field into the testing of metals.

Plas-Tech's Instrumented Dart-Drop Impact Tester was also demonstrated at the center's opening. This tester measures the amount of energy a cushioning material will absorb and transmit under a wide variety of service conditions. Mr. Silberberg explained that besides its obvious commercial application to the determination of the amount of protection afforded by rubber and other cushioning materials, this instrument has important military possibilities in investigating critical ignition conditions for solid propellants used in rocket motors.

Technical Service Program

In addition to designing and building specialized test equipment for the rubber and plastics industries, Plas-Tech is applying the expanded facilities of its new research center to a broad program of technological service. In its research laboratory, improved materials are being developed under contract from clients. The firm's processing laboratory is engaged in evaluating the effects of process variables on material properties. In its physical laboratory, materials for applications ranging from shoe heels to missile components are being characterized over a wide range of temperatures and at test speeds from the static loading rates up into the shock loading range.

Some of the services which Plas-Tech provides include monomer synthesis, polymerization, processing studies, testing and evaluation, applications development, development of new tests and design of new equipment, and the manufacture of specialized test equipment for research and for quality control purposes. Ross H. Supnik, vice-president of Plas-Tech, emphasized that the company, in addition to its commercial activities, sponsors symposia for the purpose of correlating experience gained by industrial and government laboratories concerned with high speed testing of materials. Mr. Supnik stated that the next Plas-Tech symposium will be held in Boston, Mass., on January 27, 1960.

Melvin Silberberg (right), president of Plas-Tech, explains the functions of the Plastechon Tester to RUBBER AGE staff editor, Bernard Berns.

Andrews-Alderfer Plant Closes

► Operations of the Andrews-Alderfer Division plant of the Kendall Co., Akron, Ohio, were terminated recently and plans are underway to dispose of its assets, property and equipment. Although the plant has been struck by the United Rubber Workers Local 491 since September 4, 1959, J. T. Doyle, general manager, stated that the action stems from the unsatisfactory result of efforts to develop new products and markets. "Studies have led the Kendall management to the conclusion that the capital investment in this operation can be better applied to other business opportunities," he noted. The company said that it is offering assistance to former employees in securing new employment.

Engineering Center in New York

► United Engineering Trustees, New York, N. Y., has announced that construction has begun on its multi-million dollar United Engineering Center, to be erected opposite the United Nations in New York City. Located between 47th and 48th Streets, on United Nations Plaza, the 18 story structure will house the headquarters of 18 major engineering societies with a combined membership of more than 300,000 persons. Together, the societies are responsible for a major part of the nation's technical publications, industrial standards and engineering conferences.

Novamount to Double Capacity

► Montecatini Chemical Co., Milan, Italy, has announced that Novamount Corp., an American unit of the parent Italian firm, will more than double the production capacity of its polypropylene plastic plant at Neal, West Va., scheduled to go on stream early in 1961. According to Montecatini, the capacity of the plant will be increased to 25 million pounds a year of Moplen polypropylene. Announcement of the Neal plant, Montecatini's first American industrial venture, was originally made in July, and at that time plant capacity was set at slightly more than 11 million pounds. Plant designs have been revised to accommodate the new production figure. This planned increase will not delay construction start-up which is scheduled to begin in November, the company states.

Appointed Carey-Canadian Agent

► Smith Chemical & Color Co., Inc., Brooklyn, N. Y., has been appointed by Carey-Canadian Mines, Ltd., Quebec, Canada, as warehousing agent for their line of asbestos fiber and shorts. Truckload and carload direct shipments from the mine are being made on various grades of asbestos for use in paint, caulking and asphalt compounds, adhesives, plastics and dry wall joint fillers. Local Brooklyn warehouse stocks are being maintained for the service of less than truckload users.

Ft. Wayne Hears Cunningham On Compounding Propellants

► Francis X. Cunningham (Thiokol) was the featured speaker at the technical meeting of the Ft. Wayne Rubber & Plastics Group on September 24 at the Van Orman Hotel in Ft. Wayne, Ind. This was the group's first meeting of the 1959-1960 season and 147 members were in attendance. "Compounding of Composite Solid Propellants" was the title of Mr. Cunningham's talk. He began his discussion with a review on the background of solid propellants, mentioning such advantages as simplicity, ease of maintenance, high mass ratio, reliability, and storageability. His background discussion also covered the composition of solid propellants; the manufacture of solid propellants; thrust; burning rate; and chamber pressure influences.

Mr. Cunningham then spoke about propellant compounding, stating that it is analagous to rubber compounding in that it uses binders, oxidizers and additives. He then discussed the physical properties of propellants; the ballistic properties; and the processing properties. Mr. Cunningham presented a sound movie on propellants at the conclusion of his remarks.

The group's new 1959-1960 officers were in charge at this first technical meeting. They are: *President,* Walton D. Wilson (R. T. Vanderbilt); *Vice-President,* Allen C. Bluestein (Anaconda Wire & Cable); *Secretary-Treasurer,* Arthur L. Robinson (Harwick Standard); and *Directors,* Devon Wilson (General Tire); Al Brumfield (Belden Mfg.); M. Whitefield (Naugatuck Chemical); Sam Armato (Witco Chemical); R. Knapp (U. S. Rubber); R. Mack (Western Rubber); J. Porter (H. Muehlstein); S. Shaw (Witco Chemical); and Phil Magner, Jr. (General Tire). Chairmen of the various committees for the 1959-60 season are: *Membership Committee,* Edward I. Bosworth (Columbian Carbon); *Menu Committee,* Earl B. Gottschalk (Paranite Wire & Cable); *Program Committee,* Allen C. Bluestein (Anaconda Wire & Cable); *Ticket Committee,* L. E. Rhodes (Goshen Rubber); and *Publicity Committee,* Robert Kanthak (Schacht Rubber Mfg.)

Lee Rubber Acquires Dural Molds

► Lee Rubber & Tire Corp., Conshohocken, Penna., has announced the purchase of all rubber hardware and housewares production molds and equipment of the Dural Rubber Co., Flemington, N. J. According to Lee, it is adding the production equipment to its Conshohocken facilities and the line of products formerly produced by Dural will be included in the Lee line. The acquisition of Dural molds and equipment is part of an expansion program, the company states.

Boat Trailer Tires

► According to E. F. Tomlinson, president of B. F. Goodrich Tire Co., a division of B. F. Goodrich Co., Akron, Ohio, nearly one million small boat carriers have been built by professional trailer manufacturers since 1946 and about 177,500 are expected to be built in 1959. This phenomenal growth of the boat trailer industry during the past 12 years has created a sizable new market for tires, Mr. Tomlinson states. This industry, which sprang up after World War II, has accounted for upwards of $10 million in tire sales to date, Mr. Tomlinson revealed, and this does not count the tires that are on thousands of homemade trailer rigs.

Mr. Tomlinson has estimated that about 1,600,000 boat trailers are now in use in the United States, including the homemade models. Replacement tires for these trailers, he said, will represent a sizeable market for marine equipment dealers and tire dealers in the years to come. Mr. Tomlinson feels that the market is particularly good right now because boat trailer owners are just learning the importance of carrying a spare trailer tire.

Patent Granted Posthumously

► A posthumous patent for Bunac-KS, Patent Number 2,908,676, has been granted to the estate of Edward A. Van Valkenburgh, who died on December 26, 1958. The invention, used in reclaiming rubber, would have been the ninth United States chemical patent issued to Dr. Van Valkenburgh, whose patents dealt with the processing of natural and synthetic rubber and plastics. Dr. Van Valkenburgh was said to be the only rubber chemist known to be active in research on tall oil, a by-product of the paper pulp industry.

Dr. Van Valkenburgh, who died suddenly of a cardiac failure, was associated with the rubber industry for many years. A graduate of Columbia University, he served with the United States Chemical Warfare, AEF, during World War I and was later commissioned first lieutenant. Afterwards, he entered the field of rubber, serving at several rubber companies at first, and then going into independent development work. He was active in numerous chemical societies.

► A monthly newsletter called *Tumb-L-Matic News,* will be published by Tumb-L-Matic, Inc. in order to provide data on new equipment, compounds and media and new and improved barrel finishing techniques.

DuPont Holds its Third Wire and Cable Symposium

► The Elastomer Chemicals Department, E. I. du Pont de Nemours & Co., Inc., held its third Wire and Cable Symposium on September 28 and 29 in Wilmington, Del. The two-day session was attended by 90 persons. The purpose of the meeting was to review the most recent information concerning the use of DuPont's elastomers in the wire and cable industry. Neoprene was the subject of the opening session and L. E. King served as meeting chairman. He introduced P. S. du Pont, III, secretary of the company, who presented a welcoming address. Mr. King then gave a talk on "Some Commercial Aspects of Neoprene and Hypalon." He was followed by E. S. Latimore, who gave a sales promotion review. The speakers for this first-day session also included C. E. McCormack, who spoke on "A Review of Developments in Neoprene Compounding"; R. M. Murray, whose subject was "Neoprene Jackets for Low Temperature Military Specifications"; and G. B. Ritzinger, who spoke on "A Study of Neoprene's Resistance to Fungus Attack." A group discussion followed the talks with J. P. Fuller serving as discussion moderator.

A dinner was held on Monday evening in the Gold Ballroom of the Hotel du Pont. P. P. Murawski served as toastmaster, and the guest speaker was Gerhardt Von Tormann, common market coordinator for the West German wire and cable industry.

Hypalon was the subject of two talks presented during the morning session of the second day. The talks were "Hypalon 40 and LD-220, New Chlorosulfonated Polyethylenes for wire and Cable," by A. C. Stevenson, and "Hypalon in Cable Applications," by F. W. Keeley, J. P. Fuller served as moderator for the group discussion which followed the two presentations. The final session of the day was devoted to the subject of new polymers. The two talks presented were "Characteristics of Viton," by T. D. Eubank, and "The Fast Moving Field of Polyurethane Elastomers and Coatings," by J. S. Rugg.

Grace Sells Some Vinyl Assets

► Certain assets involved in the manufacture of vinyl welting have been sold by the Dewey & Almy Chemical Division of W. R. Grace & Co., Cambridge, Mass. The assets were purchased by the Walter L. Johnson Co., Inc., a wholly-owned subsidiary of Endicott Johnson Corp., Endicott, N. Y. The purchasing company is in the leather welting field and equipment will be transferred to its plant as soon as possible. Technical staff to assist in setting up equipment and training operating personnel are being made available by Dewey & Almy.

Hewitt-Robins Closes Buffalo Foam Rubber Plant

► Hewitt-Robins, Inc., Stamford, Conn., has announced, in a special report to stockholders, the shutdown and liquidation of its rubber foam cushioning production facilities at Buffalo, N. Y. Commenting on the move, Thomas Robins, Jr., chairman of the board, and Austin Goodyear, president of Hewitt-Robins, said that the management had for some years foreseen the possibility that the firm's new polyurethane foam cushioning, made at Franklin, N. J., might ultimately replace its rubber foam cushioning lines, and this trend has been gaining momentum steadily.

The statement reports that there has been a deteriorating price situation in rubber foam, causing heavy annual losses in this product line in recent years, and culminating in drastic additional price cuts initiated in the industry in July, 1959. This fact led to the decision to shut down the Buffalo rubber foam plant. Hewitt-Robins' other Buffalo plant, manufacturing conveyor belt and industrial hose products, continues to operate at a high level, the company states.

Company stockholders were notified that the substantial rubber foam nonrecurring losses and charge-off set aside in the third quarter would be reflected in third quarter results. These results are expected to show a loss in the range of $1.00 to $1.25 per share. Messrs. Robins and Goodyear also pointed out that without the losses applicable to now discontinued products, the company's earnings for 1958 would have been about 18 per cent higher than reported, even after absorbing the very heavy polyurethane foam development and start-up costs.

Copolymer Rubber To Expand Plant

► Copolymer Rubber & Chemical Corp., Baton Rouge, La., has announced its plans for a $3 million expansion project. According to the company the primary goal in the expansion plan is an increase in the capacity for production of its new Carbomix rubber. Also included in the expansion are a new 95,000 square-foot warehouse, and enlargement of pilot plant facilities employed by the firm's research staff. The company expects the expansion project to be completed by October, 1960, and plant capacity to be increased to 125,000 tons of rubber per year. In 1955, the plant's capacity was 49,000 tons per year. Copolymer is jointly owned by seven companies, which purchased the plant from the government in 1955. The co-owners are Seiberling Rubber Co.; Dayton Rubber Co.; Armstrong Rubber Manufacturing Co.; Gates Rubber Co.; Armstrong Rubber Co.; Mansfield Tire & Rubber Co.; and Sears, Roebuck & Co.

James J. Hamill

Wins Dinsmore Award

► James J. Hamill has been presented with the Dinsmore Award at Goodyear Tire & Rubber Co., Akron, Ohio, for his outstanding work in research. Mr. Hamill is the first member of Goodyear's Research Division to receive the award, which is given to Goodyear men who are exceptional in their respective fields. He was nominated for his work on the development of microscopical techniques and their application to synthetic rubber latex production. His work resulted in improved quality, less troublesome manufacturing procedures and reduced costs. His research lasted for one and a half years.

Mr. Hamill graduated from the University of Colorado in 1949, and was an assistant instructor in chemical microscopy there. He joined Goodyear in 1950 following service in the United States Army. Mr. Hamill is a member of ASTM Committee D-11 on Rubber and Rubber-Like Materials, and represents the rubber industry on the ASTM Microscopy Committee.

Repackages Rubber Items

► B. F. Goodrich Co., Akron, Ohio, has initiated a major program to increase its business in the prescription accessories market. The program is designed to result in an estimated 20 per cent sales increase in 1960 for Goodrich drug store items that range from hot water bottles to baby pants. The firm has unveiled a packaging line which has been described as being "unique in the field and designed to step up impulse buying in drug stores across the country." In addition to having an attractive appearance, the new B. F. Goodrich packaging is said to be stronger; adapt to self-display; offer the customer easy product examination without product or package damage; and to save storage space for both the wholesaler and retailer.

Government Begins Selling From Natural Rubber Stockpile

► On October 16 the General Services Administration began selling, without replacement, natural rubber from its stockpile. The sale was made in accordance with the provisions of the Independent Offices Appropriation Act of 1960 which provides for the sale without replacement of excess perishable stockpile items which otherwise would suffer from deterioration. Sales were for delivery from the stockpile in October or succeeding three calendar months as in the past rotation program. In all sales, GSA equalized freight with the purchaser, with his normal port of entry in order to protect GSA's intransit privileges.

The stockpile sales were negotiated by phone on the basis of prevailing market prices in such a manner as to avoid disruption of the usual rubber market while protecting the United States against avoidable loss.

The Government has over $900 million of rubber in its stockpile. GSA plans to sell some 470,000 long tons over a nine-year period. The agency now has authority to sell only 40,000 to 50,000 long tons in the fiscal year ending June 30, 1960, therefore it will have to obtain new approval from Congress to carry out the remainder of the rubber sales program.

Mass Production of Truck Wheels

► Firestone Steel Products Co. has announced that the application of two novel manufacturing processes is making possible the mass production of heavy-duty precision truck wheels. The two methods, spin-forming and thru-welding, are being used at the company's plant in Wyandotte, Mich., to produce a new Accu-Ride wheel. According to Firestone, spin-forming is a more accurate method of forming wheel discs than any other now in use. The wheel disc is uniformly tapered as it is being formed over a mandrel. Thru-welding, also new to the production of large wheels, is a method used to unite the rim and disc.

Approve Stock Split

► At a special meeting, stockholders of the Brunswick-Balke-Collender Co., Chicago, Ill., approved a proposed three-for-one split in the company's common stock. Also approved, was an increase in the authorized number of common shares to 12 million from the previously authorized 5 million, according to R. F. Bensinger, chairman. The new stock was to have been distributed November 12 on the basis of two additional shares for each share held, to shareholders of record October 28. As of September 30, there were 2,415,637 shares outstanding.

Replaceable Tread Tire Introduced by Pirelli

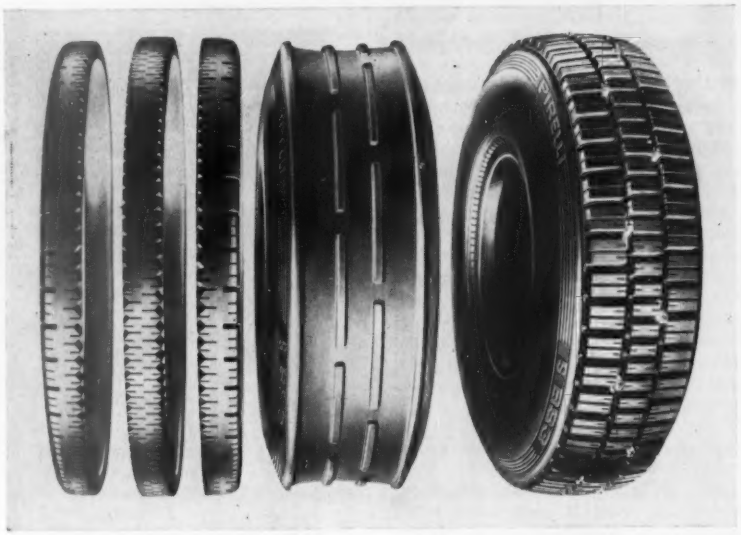
► A completely new concept in tire making, an automobile tire with a three-band replaceable tread, has been introduced at the Turin Automobile Show by Pirelli of Milan. Differing from traditional types, which are made in a single unit, the new tire consists of a casing and three separate tread rings which are fitted over the casing parallel to each other. According to Pirelli, the tread rings can be mounted or dismounted with a minimum of time and effort, and without tools. Their diameter is less than that of the casing and when the rings are placed around the casing and the tire is inflated, pressure secures them firmly in place. Lateral movement is prevented by radial ridges which are said to insure a perfect seating for the three rings.

Advantages of the new product listed by Pirelli are that when a tread is worn, it is possible to substitute a new one without buying a complete new tire; The pattern of the tread can be changed easily to adapt to special conditions of terrain and weather; As a substitute for chains, tungsten steel spikes may be inserted between adjacent rings of winter pattern treads for maximum safety and comfort on icebound roads.

Because the tread is firmly fixed to inextensible wire reinforcement which forms the base of the rings, Pirelli says, grooves on the tread remain permanently open, even when under the strain of braking or cornering. This results in road-holding that is especially good on both wet and dry roads. Other advantages enumerated are that the tread always rolls and rarely slips, so that the tire does not squeal on sharp corners taken with speed; Especially at high speeds, the replaceable tread rings are said to give the tire freer rolling movement because of the extremely low power absorbancy.

The tire also has a tendency to make steering light, which results in more restful driving, Pirelli states. Because it is possible to replace the rings and because these rings do not scuff on the ground, the new tire also has longer life. Chances of a puncture are remote as the rings are backed with metallic cords which form a protective shield and as the inner tube is equipped with a Pirelli patent safety valve which slows down deflation and controls leakage in event of damage to the tube.

Tested for more than 1,000,000 miles, the new Pirelli replaceable tread tire is said to have demonstrated complete safety as well as exceptional qualities of durability, sturdiness, road-holding, lightness of steering and noiselessness. Currently in production in Italy, it will be available for the American market within a few months. The tire is being offered with normal and winter tread patterns, the latter of which can be fitted with steel spikes.



The replaceable tread tire consists of a casing and three tread rings. The standard tread (left) is designed for normal driving conditions. Ice spikes may be used with the winter tread (right) for snow and ice-bound roads.

Enjay Names Three

► Enjay Co., Inc., New York, N. Y., has announced the appointment of J. P. Haworth, formerly Eastern Division manager, as assistant sales manager succeeding P. L. Richards, who has joined the Esso Export Corp. H. C. Evans, previously Akron District manager, has been named to succeed Mr. Haworth, while G. H. Lowden, formerly a representative in charge of the company's Detroit office, has been appointed Akron District manager.

A graduate of Ottawa University, Mr. Haworth spent six years with an affiliated research company before he joined Enjay's Butyl Division in 1955. He was appointed Eastern Division manager in 1956. Mr. Evans, a chemical engineer from Iowa State, served with affiliated companies until 1943, when he joined Enjay as a sales representative. He became district sales supervisor at Tulsa, Okla., in 1953, and Akron District manager two years later. Mr. Lowden, a graduate of Dartmouth, joined Enjay from an affiliate in 1953 as a sales representative. He was named head of the Detroit office in 1957.

Firestone Buys Industrial Unit

► Firestone Tire & Rubber Co., Akron, Ohio, has purchased an industrial site at Hopewell, Va., for the production of synthetic fibers, the first of which will be nylon. At this unit, the company plans to produce its own nylon filament yarn for the manufacture of tire cord. The company will modernize structures now located on the 250 acre site, at which approximately 450,000 square feet of manufacturing space is expected to be immediately available. Initially, the Hopewell plant will be devoted to the manufacture of nylon filament yarn and the first stage of a manufacturing unit for the production of polypropylene resin. Firestone Plastics Co., Pottstown, Penna., which will become the company's Plastics and Synthetic Fibres Division and will assume management responsibility for the Hopewell plant. Roger S. Firestone will be president of the expanded operations and Ernest T. Handley, executive vice-president.

Tire Repair Materials

► U. S. Rubber Co., New York, N. Y., has introduced an improved line of repair materials for passenger and heavy service tires, which are designed to increase handling ease and shop efficiency, it was reported. According to the company, all retreading and repair gums and fabrics in the line are made from selected natural rubber compounded to reinforce original tire construction. A feature of the new line is a high tenacity vulcanizing cement that is quick drying and has improved flow and penetration, the company states. The complete line includes retreading gums, repair gums, repair fabrics, fabric tire repair units, tubeless tire repair materials, tube and valve repair materials, cements, coatings and solvent, shop supplies, flat base curing tubes, and section repair curing bags. All retreading and repair gums, stripping stock and cord repair fabrics are backed by polyethylene film to seal out air and moisture.

Improved Viton Rubber Introduced By Dupont

► A new type of Viton synthetic rubber, identified as Viton B, is said offer significant improvement in extremely high temperature conditions and in contact with concentrated chemicals, according to the Elastomer Chemicals Department of E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

The addition to the family of Viton polymers, which has previously included Viton A and Viton A-HV, broadens the service area for the versatile fluoroelastomers both in mechanical goods and in coated fabrics on a variety of substrates for special application, the company states.

Heat aging tests at temperatures in the range of 500 to 600°F. show that properly compounded vulcanizates of Viton B retain more elongation and show less change in hardness and weight than similar samples made with the previously available types. Tensile strength retention is essentially equivalent. Embrittlement at elevated temperatures occurs much more slowly, and useful elasticity is prolonged to the point that service life is twice as long in many applications.

Vulcanizates of the new type exhibit the high resistance to oil and solvents characteristic of Viton fluoroelastomers, with superior performance exhibited in contact with diester lubricants such as specified in MIL-L-7808, phosphate ester hydraulic fluid, tricresyl phosphate, and benzene.

Good Chemical Resistance

The new type of Viton synthetic rubber has exceptional chemical resistance, with superiority demonstrated especially after exposure to sodium hydroxide and nitric acid at 158°F., as well as to red fuming nitric acid and glacial acetic acid at room temperature.

Like its predecessors, Viton B is a light-colored, odorless polymer. It has a Mooney viscosity intermediate between Viton A and A-HV. Specific gravity is 1.86. Vulcanizates have a higher modulus, similar elongation, and higher hardness than those based on Viton A. Tensile strength is approximately the same at room temperature, and slightly higher at 300°F.

With proper proportions of curing agent, vulcanizates made with Viton B have compression set resistance equivalent to other types. Tear resistance is better, both at room and elevated temperatures, and can be further improved by use of a silica filler in place of carbon black. Resilience is approximately the same as measured by the Yerzley Osillograph test, and static modulus and effective dynamic modulus are higher, DuPont states.

Results of Taber abrasion tests indicate better abrasion resistance for Viton B. Electrical properties are also im-

Table I—Typical Vulcanizate Properties of Viton B

Mooney Scorch at 250 Degrees F. (MS)	
Minimum	71
Min. to a 10 Pt. Rise	20
Cure: Press—30 Minutes/300 degrees F. Oven—Step Cure to 400 degrees F. + 24 Hours/400 degrees F.	
Stress-Strain—Original at 75 Degrees F.	
Modulus at 100 per cent, psi	550
Modulus at 200 per cent, psi	1250
Tensile Strength, psi	2250
Elongation at Break, per cent	390
Hardness, Shore A	74
Stress-Strain—Original at 300 Degrees F.	
Modulus at 100 per cent, psi	360
Tensile Strength, psi	500
Elongation at Break, per cent	130
Stress-Strain—After 20 Days at 500 Degrees F. (Oven)	
Modulus at 100 per cent, psi	350
Tensile Strength, psi	550
Elongation at Break, per cent	400
Hardness, Shore A	83
Stress-Strain—After 10 Days at 550 Degrees F. (Oven)	
Modulus at 100 per cent, psi	410
Tensile Strength, psi	450
Elongation at Break, per cent	180
Hardness, Shore A	81
Stress-Strain—After 2 Days at 600 Degrees F. (Oven)	
Modulus at 100 per cent, psi	400
Tensile Strength, psi	500
Elongation at Break, per cent	240
Hardness, Shore A	83
Weight Loss, per cent	10.9
Compression Set—Method B	
70 Hours at 250 degrees F.	27
46 Hours at 350 degrees F.	37
22 Hours at 450 degrees F.	93
Winkleman Tear, lbs./in. (Notched)—Original	
75 degrees F.	185
300 degrees F.	38
Yerzley Oscillograph—Compression at 75 Degrees F.	
Resilience	47
Load at 20 per cent Defl., psi	210
Static Modulus, 5 per cent Defl., psi	1100
Effective Dynamic Modulus, psi	2485
Taber Abrasion—H-22 Wheel—1,000 Gram Load	
Weight Loss (1,000 rev.)	0.143 gram
Loss per Revolution	0.143 mg.
Low Temperature Properties—0.075-in. Thick Specimen	
Brittle Point, degrees F.	—49
Temperature Retraction, degrees F.	
T_{10}	+7
T_{50}	+24
Clash-Berg Stiffness Test, psi	
75 degrees F.	438
+20 degrees F.	943
+10 degrees F.	4,757
0 degrees F.	53,154
Electrical Properties (6 x 6 x 0.025-in. slab)	
D. C. Resistivity, ohm-cm.	1.4×10^{14}
Specific Inductive Capacity	8.53
Power Factor, per cent	2.5

Table II—Oil and Solvent Resistance of Viton B

Fluid	Per cent Volume Increase	Tensile, Per-cent Retained	Elongation, Per cent Retained	Hardness, Pts. Change
Oils and Fuels				
70/30 Isooctane-Toluene[1]				
7 Days at 75 degrees F.	1.0	90	100	+1
Silicate Ester Hydraulic Fluid[2]				
7 Days at 400 degrees F.	3.0	75	98	—2
14 Days at 400 degrees F.	3.5	74	68	+1
21 Days at 400 degrees F.	4.0	67	54	0
Silicate Ester Hydraulic Fluid[3]				
7 Days at 400 degrees F.	4.4	80	68	—1
14 Days at 400 degrees F.	6.7	53	39	—2
21 Days at 400 degrees F.	7.3	43	29	0
Diester Lubricant[4]				
7 Days at 400 degrees F.	9.3	71	98	—3
14 Days at 400 degrees F.	12.0	62	73	—4
21 Days at 400 degrees F.	12.6	59	68	—4
Phosphate Ester Hydraulic Fliud[5]				
7 Days at 300 degrees F.	96.5	29	68	—46
Solvents				
Tricresyl Phosphate				
7 Days at 300 degrees F.	6.9	93	110	—3
14 Days at 300 degrees F.	6.9	81	88	—4
21 Days at 300 degrees F.	6.9	71	83	—3
Benzene				
7 Days at 75 degrees F.	12.3	79	93	—8
14 Days at 75 degrees F.	14.7	62	83	—8
21 Days at 75 degrees F.	15.2	61	73	—8
Methyl Ethyl Ketone				
7 Days at 75 degrees F.	313	—	—	—43

Notes: (1) Ref. Fuel B. (2) OS-45. (3) Oronite 8515. (4) Turbo Oil No. 15 (MIL-L-7808). (5) Skydrol 500.

Table III—Chemical Resistance of Viton B

	Per cent Volume Increase	Hardness, Pts. Change
Sodium Hydroxide (46 Per cent)		
7 Days at 75 degrees F.	0.2	0
14 Days at 75 degrees F.	0.3	—1
21 Days at 75 degrees F.	0.2	—1
7 Days at 158 degrees F.	0.4	—8
Hydrochloric Acid (37 Per cent)		
7 Days at 75 degrees F.	0.7	0
14 Days at 75 degrees F.	1.1	0
21 Days at 75 degrees F.	1.6	0
7 Days at 158 degrees F.	2.1	0
14 Days at 158 degrees F.	2.3	0
21 Days at 158 degrees F.	2.5	—1
Hydrofluoric Acid (48 Per cent)		
7 Days at 75 degrees F.	0.7	0
14 Days at 75 degrees F.	1.6	—1
21 Days at 75 degrees F.	1.7	—2
Nitric Acid (70 Per cent)		
7 Days at 75 degrees F.	3.8	0
14 Days at 75 degrees F.	5.2	—1
21 Days at 75 degrees F.	6.9	—4
7 Days at 158 degrees F.	41	—40
Fuming Sulfuric Acid		
7 Days at 75 degrees F.	4.2	—2
Red Fuming Nitric Acid		
7 Days at 75 degrees F.	24	—16
Glacial Acetic Acid		
7 Days at 75 degrees F.	88	—25

proved, particularly when a mineral filler is used. Ozone resistance is excellent, as is radiation resistance under exposure to gamma radiation from a Cobalt-60 source. Like other types of Viton, the new product will not support combustion.

The solubility of Viton B in a number of highly polar solvents such as methyl ethyl ketone, ethyl acetate, acetone, and dimethylformamide allows the use of the polymer in a variety of coating applications. Solution viscosity of compounds is intermediate between that of Viton A and A-HV. Smooth, workable solutions with solids contents in the range of 20 to 35 per cent may be obtained. These solutions may be cast to form unsupported films or used as coatings on a variety of substrates including fabrics and metals.

Viton B synthetic rubber has been found to be especially useful as a heat and chemical resistant coating for fabrics. A one-ply glass fabric with original tensile strength of 91 pounds, for instance, after 100 hours exposure at 550°F., had a grab tensile strength on a one-by-six-inch strip of 78 pounds, while weight loss was only 12.2 per cent.

Formulations for Viton B contain the same type of compounding ingredients that are used with other Viton polymers. In general, these include a curing agent, a metallic oxide, and some type of filler. A small amount of plasticizer is used in some cases to aid processing. A higher amount of curing agent is necessary in order to obtain the best properties, particularly in compression set resistance.

U. S. Rubber Vulcanizing Process

► A new process developed by U. S. Rubber, New York, N. Y., for vulcanizing butyl synthetic rubber is said to be helping the rubber industry turn out better tires at a faster rate. The major application for the process is in the manufacture of butyl bags which are said to last longer, permit faster tire curing at higher temperatures and improve quality by giving more uniform control of the tire curing process. According to Dr. Paul Viohl, company research scientist, U. S. Rubber studies begun in 1948 led to a resin-cured butyl in which phenol dialcohol resin produces a butyl highly resistant to heat and oxygen. When vulcanized with sulfur in the conventional manner, butyl rubber would de-vulcanize at temperatures over 300°F.

Dr. Viohl was one of seven men recently honored by the company for their participation in the new development. The process was made available this year to the entire rubber industry, after several years of successful use by U. S. Rubber's Tire Division. All the larger manufacturers of tires are now licensed to vulcanize butyl by the new process.

European Survey Planned

► Foster D. Snell, Inc., and Robert S. First, Inc., New York, N. Y., have announced the initiation of a multiple client survey of European methods and techniques of processing plastic materials. According to the companies, this joint international project should be of interest to resin manufacturers, plastic fabricators and manufacturers of plastic fabrication machinery. A survey team, jointly sponsored by Snell and First, plans to visit approximately 400 companies, which are fabricators of plastics and manufacturers of plastic fabrication machinery, in England, France, Switzerland, Sweden, West Germany, Holland, Belgium and Italy.

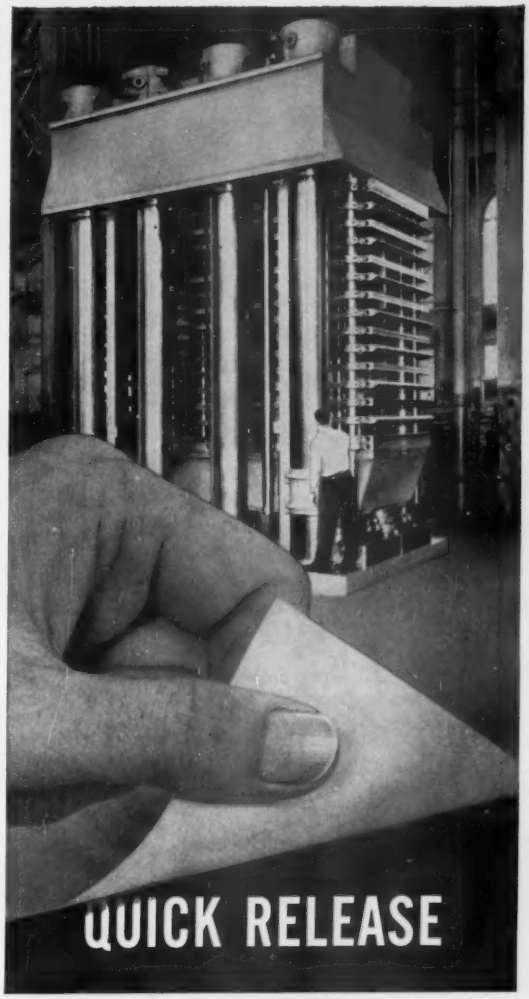
The objective of this survey will be to determine what new methods and techniques of processing plastic materials and what machinery is available for license in the United States. Included in the survey will be a brief description of each process or machine; some data on the economics involved; and whom to see to start negotiations. Snell and First report that their minimum budget for the project will be $50,000, and the cost to each subscribing company will be but a small fraction of this sum. The survey will begin in December and will be delivered to clients in September, 1960. Additional information can be obtained from: Foster D. Snell, Inc., 29 West 15th St., New York 11, N. Y., or Robert S. First, Inc., 6 East 39th St., New York 16, N. Y.

Ontario Holds Golf Outing

► The Ontario Rubber Group held its annual golf tournament on September 18 at the Dundas Golf and Country Club, Dundas, Ontario. William Hogg (Naugatuck Chemical) served as chairman of the golf committee. One hundred and twenty golfers participated in the tournament and the low gross winners were Dick Knowlton, Dean Bregman, Charles Pavanel and Bob Lovell, (Goodrich). Des Seymour (Cabot Carbon) and Doug Rodenburg (Naugatuck Chemical) were tied for first low net. Following the golf tournament, a dinner was given which attended by 168 persons. Door prizes, obtained by local company contributions, were distributed to about 90 per cent of those in attendance.

Texus to Build Laboratory

► Texas-U. S. Chemical Co., New York, N. Y., has completed plans to expand its research and development facilities in Parsippany, N. J. A fully equipped, all brick, two-story laboratory will be constructed to accommodate over 150 persons and provide additional space and facilities for research and development work, largely in the polymer and petrochemical fields. Sales technical service will also be expanded. Construction is slated to begin in May, 1960.



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The past presidents who were honored at the October 8 meeting of the Northern California Rubber Group. They are: front row (left to right), Don Good (American Rubber Mfg.); Ross Morris (Mare Island Naval Shipyard); George Farwell (Goodyear); and Russ Kettering (Oliver Tire). Back row (left to right), Bill Deis (Merck & Co.); Ralph Hickcox (Oliver Tire); Halsey Burke (Burke Rubber); Jim Stull (Retired); Joe Hollister (Mare Island Naval Shipyard); and Fred Swain (R. D. Abbott).

NCRG Honors Its Past Presidents

► Past presidents of the Northern California Rubber Group were honored on October 8 at the Berkeley Elk's Club in Berkeley, Calif. This was the fourth annual past presidents' night held by the group. The guests of honor were Russ Kettering (Oliver Tire); George Farwell (Goodyear); Ross Morris (Mare Island Naval Shipyard); Fred Swain (R. D. Abbott); Joe Hollister (Mare Island Naval Shipyard); Jim Stull (Retired); Halsey Burke (Burke Rubber); Ralph Hickcox (Oliver Tire); Bill Deis (Merck & Co.); and William "Don" Good (American Rubber Mfg.).

"Don" Good, one of the founders of the NCRG and president in 1949, was awarded an achievement trophy by the group in commemoration of his 50 years of active service in the rubber industry. The presentation was made by Drace Kutnewsky (Burke Rubber), group president. The trophy, a white onyx base on which is mounted a pen, a transparent red plastic clock, and a gold gavel, bears the following inscription: "W. D. Good—Honoring 50 years valuable service to rubber technology—1909-1959—Northern California Rubber Group". Mr. Good began his career in Akron, Ohio, with the B. F. Goodrich Co., and in 1921 he formed his own company, the Good Rubber Co., which he operated until 1931. He spent the years from 1933 to 1935 in England with the Commercial Rubber Products Corp. Mr. Good returned to the United States in 1935 and in 1938 joined American Rubber Manufacturing Co., where he is presently serving as chief chemist and factory manager.

Following the business meeting and a dinner, Dr. Harry Coderre, industrial psychologist with Rohrer, Hibler and Replogle, presented a talk entitled "Organization and the Man," in which he stressed individuality and creativity among members of management rather than conformity. Dr. Coderre pointed out some of the things that can be done about the many conditions that encourage conformity. They are: keep the channels of organization as simple as possible; think in terms of freedom to operate rather than delegation; review personnel regularly, being critical of both technical accomplishment and attitudes; encourage the trying of new ideas; tie responsibility to an individual rather than a group; and never divorce the development of people from supervision. He explained that by using these principles we can combat conformity without moving in the direction of worshipping non-conformity just for its own sake.

Annual Outing Held

Over 90 members and guests attended the annual summer outing of the Northern California Rubber Group which was held on August 12 at Turtle Rock Ranch near Oakland, Calif. The featured attraction was barbecue steak a la Burke prepared by Chefs Norman Burke, Drace Kutnewsky, Virgil Price and Ray Brown, all of Burke Rubber Co. John Moriarty (Quaker Pioneer Rubber) served as outing chairman, and he was assisted by Doug Higgins (Gates Rubber); Don Preiss (Shell Development); Henry Krakowski (Oliver Tire); Roger Thacher (Union Rubber); and Frank Groch (Stauffer Chemical). Highlighting the day's activities was an egg throwing contest which was won by Robert Murphy (Mansfield Tire & Rubber) and Mrs. Eugene Gadore, wife of Eugene Gadore (Oliver Tire). Other activities included bingo, volleyball, and horseshoes for the adults, and swimming and races for the children in attendance.

Firestone Appoints Six

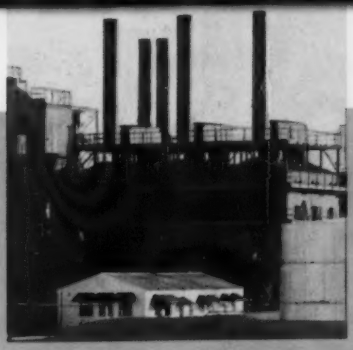
► Six new appointments have been announced by the Firestone Synthetic Rubber and Latex Co., Akron, Ohio, including F. T. Reynolds, as staff assistant to the general sales manager; Harry W. Sutton, as technical service manager for rubber; and W. L. Pearson, as technical service manager for latex. E. H. Ketner has been named to the newly created post of latex trade sales manager; Donald S. Phillips, as representative for the southeastern states; and David Eisenhart as representative for sections of Ohio, Indiana, Michigan, Pennsylvania and West Virginia.

Mr. Reynolds joined the Firestone Synthetic Rubber Division in 1957 as a sales representative. Formerly, he was associated with the government synthetic rubber program. Mr. Sutton joined Firestone two years ago as a technical service representative after nearly 30 years' experience in the development and manufacture of mechanical rubber goods. Mr. Pearson, a graduate of Georgia Institute of Technology, became associated with the firm in 1958 after several years' experience in the fields of natural and synthetic latex uses. Mr. Ketner started with Firestone in 1950 as sales engineer for Xylos Rubber Co. Four years ago, he was transferred to the synthetic division. Mr. Phillips joined Firestone in 1954 after graduating from Clarkson College of Technology. Mr. Eisenhart attended the University of Akron and joined Firestone four years ago as a laboratory technician at the synthetic plant.

Montecantini C 23 Rubber

► Montecatini S.A., Milan, Italy, has recently released the first technical information on its new ethylene-propylene copolymer elastomers, called "C 23." The copolymers are derived through the use of special catalysts developed by Prof. Giulio Natta of Milan Polytechnic Institute for the stereospecific polymerization of alpha-olefins. According to Montecatini, the new synthetic C 23 rubber is a very high molecular weight copolymer produced by "pre-engineered" polymerization of ethylene and propylene. Its low specific gravity (0.85—0.86 g/cm³) is said to permit specialized applications and to lower the cost of finished articles by giving more product per unit weight of material.

The company reports that the overall properties of C 23 are very near to those of natural rubber. Rebound at 20°C. is 75 per cent (Luepke pendulum), and its minimum is reached at —35°C. The copolymer is said to possess excellent electrical insulating and thermal characteristics. Technical information bulletins on the C 23 ethylene-propylene synthetic rubber will be available from Chemore Corp., New York, N. Y., which represents Montecatini in the United States and Canada.



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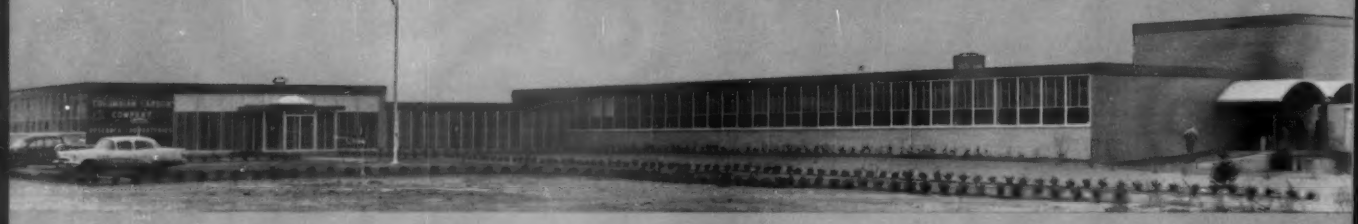

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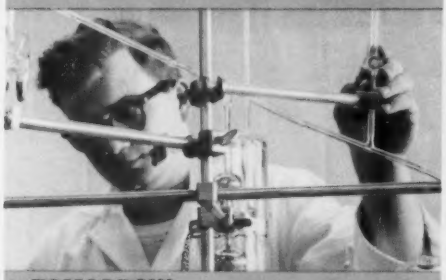

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Ervin S. Kern (R. T. Vanderbilt), left, vice-chairman of the New York Rubber Group, discusses the butyl technical program with the three featured speakers, left to right, C. H. Lufter (Goodrich Chemical); R. M. Cardillo (Enjay) and R. F. Leary (Enjay).

Panel on Butyl Rubber Features New York Rubber Group Meeting

► Butyl rubber was the subject of three talks presented at a technical meeting of the New York Rubber Group, which was held on October 16 at the Henry Hudson Hotel in New York City. The meeting was attended by 250 members who heard about the developments and applications of butyl rubber from the three featured speakers, C. H. Lufter (Goodrich Chemicals); R. M. Cardillo (Enjay); and R. F. Leary (Enjay).

The dinner program was highlighted with a talk on "Reminiscences of a Big Leaguer" by Frankie Frisch, a member of baseball's Hall of Fame. The newly elected 1960 officers were introduced to the group. They are: *Chairman,* Ervin S. Kern (R. T. Vanderbilt); *Vice-Chairman,* Henry J. Peters (Bell Laboratories); *Secretary-Treasurer,* M. E. Lerner (RUBBER AGE); *Sergeant-at-Arms,* Clifford J. Lewis (U. S. Rubber); *Executive Committee,* W. R. Hartman (Laurie Rubber); M. A. Durakis (General Cable); J. T. Dunn (Thiokol Chemical); and J. E. Walsh (Stamford Rubber Supply). The officers will serve for one year; the executive committee members will serve for a three-year term.

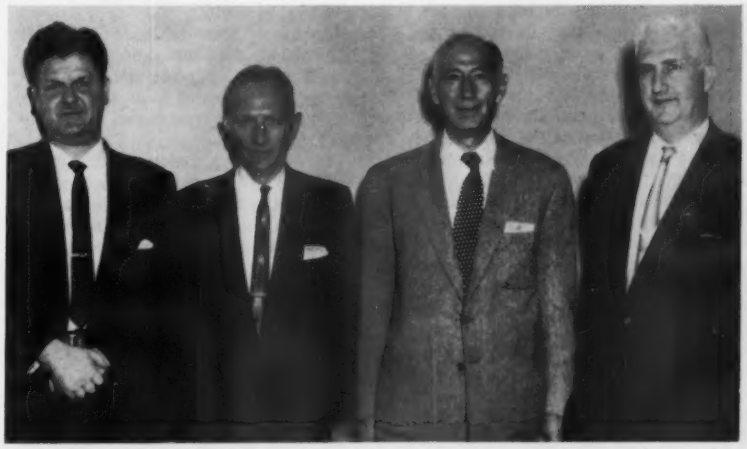
Ervin S. Kern (R. T. Vanderbilt), group vice-chairman, arranged the technical program, and the speakers were introduced by R. B. Carroll (R. E. Carroll), group chairman. "Brominated Butyl and Its Applications" was the subject of Mr. Lufter's talk. He stated that the excellent properties of butyl rubber are retained and some of the troublesome characteristics eliminated by the addition of a small amount of bromine to the butyl polymer. This type of modification produces a rubber with an increased cure rate, increased compatibility with other polymers, good adhesion to metals and other rubbers, and the advantages of a polymer with active centers susceptible to new cure systems, he added.

Mr. Lufter pointed out that application of brominated butyl is seen where adhesion of butyl is a problem, for example tire innerliners and recapping; where cure rate is vital, such as cable jacket and most molded parts; where blends with other polymers are preferred, as in white sidewalls and parts for special chemical resistance; and where new cure systems are used, such as the methylol phenol and dithiol systems.

In discussing "Dynamic Properties of Butyl Rubber," Mr. Cardillo explained that the unusual dynamic properties of butyl rubber are leading to its increased usage in a wide variety of applications. He stated that high energy absorption or damping is a property of particular interest. Mr. Cardillo pointed out that the butyl chain is almost entirely composed of polyisobutene with a very small amount of isoprene. The polyisobutene structure has high chain symmetry and many side groups, and these contribute to the restricted chain movements that account for high damping. High damping can be utilized in many applications where controlled elasticity and absence of bounce and recoil are helpful, he added. Mr. Cardillo remarked that damping is also useful in many vibrational control problems, and this has led to an increasing use of butyl in this field by the automotive industry.

Mr. Cardillo also mentioned a new test system which has been developed to evaluate butyl's dynamic properties. He explained that this method is unique in that it makes use of a high speed stress relaxation test to obtain dynamic modulus and loss information under conditions of cyclic deformation. The great flexibility of this method with regard to strain level, frequency and temperature makes it an ideal tool for general purpose studies of dynamic behavior. According to Mr. Cardillo, these studies can be used to predict the response of butyl rubber in many new applications.

"Butyl Rubber in Automotive Tires" was discussed by Mr. Leary. He covered the present status of the butyl tire in regard to performance, with the presentation of a short film. Mr. Leary then reviewed the problems which were encountered in butyl tire development and described briefly what was done about each problem. The problems mentioned by Mr. Leary included durability (carcass, bead), tread wear, and costs (material, building).



The newly-elected 1960 officers of the New York Rubber Group. They are, left to right, *Sergeant-at-Arms,* Clifford J. Lewis (U. S. Rubber); *Chairman,* Ervin S. Kern (R. T. Vanderbilt); *Vice-Chairman,* Henry J. Peters (Bell Laboratories); and *Secretary-Treasurer,* M. E. Lerner (RUBBER AGE).

Pliolite 5352 Called 100% Natural Latex Replacement

► Development and volume production of a new synthetic rubber latex as a 100 per cent replacement for natural latex in foam rubber has been announced by the Goodyear Tire & Rubber Co., Akron, Ohio. The company's Foam Products Division plans to convert entirely to the new latex in the manufacture of Airfoam cushioning materials. The new latex, called Pliolite 5352, will be marketed to foam manufacturers at 20 to 30 per cent under the natural latex price. The result of a $1 million, 18 month research program, it is said to be an important milestone in the technological advance of synthetic rubber.

According to Goodyear, this latex is capable of producing a premium foam rubber to meet the high cushioning standards set by automotive, furniture, mattress and other manufacturers without blending in natural or other synthetic latices. These developments were announced at a press conference headed by R. A. Jay, assistant to the president, H. R. Thies, Chemical Division general manager, R. E. Pauley, Foam Products Division general manager, and T. H. Rogers, manager of latex and foam research. Discussing Pliolite 5352, Mr. Jay said "Not only is it a 100 per cent replacement for natural rubber latex in foam, but indications are that it can replace natural latex in other areas where, until now, only the tree-grown product could be used." He went on to announce that Goodyear has completed expansion of its synthetic latex production facilities at Akron in order to meet expected demand.

T. H. Rogers, Goodyear's manager of latex and foam research, demonstrates the differences between Pliolite 5352 (right) and the most commonly used synthetic latex now on the market.

Impurity Content Reduced

"The new material" Mr. Jay said, "is closer to natural latex than any previously produced, since the impurity content has been reduced to nearly equal that contained in natural latex." It was explained that in comparison with the other most commonly used synthetic rubber latices, Goodyear's new Pliolite 5352 has less than half the non-rubber materials in its composition. Utilization of the new latex is expected to assist greatly in stabilizing the flexible price structure of foam rubber products he said. "For some time", he continued, "the latex foam industry has been under heavy pressure as a result of inroads made by other low-cost foam materials. Pliolite 5352 makes it possible for the foam industry to more than hold its own against these other materials—both from an economic and quality standpoint." Goodyear, like the rest of the industry, he stated, has in the past depended largely on imported natural latex to produce premium quality foam rubber goods.

"This resulted in unstable costs," Mr. Jay explained, "because of transportation from overseas plantations and heavy demand in the face of limited supply. Spoilage and inventories of natural latex also were difficult to control." Made under carefully controlled chemical plant conditions, the new synthetic latex assures foam manufacturers of consistent quality at low, stabilized costs. Goodyear's conversion to Pliolite 5352 in Airfoam manufacture is about 70 per cent complete. The complete changeover is expected by early 1960. According to Mr. Jay, a lighter, whiter foam rubber can be made from the new latex with aging properties about twice as good as foam made from natural latex. Laboratory tests show that germicidal and fungicidal properties are considerably better than any other cushioning or foam material. Excellent compression, resilience and durability, as well as good flex-life, are other important advantages of foam made from Goodyear's new synethetic, Mr. Jay concluded.

Mr. Thies discussed the introduction of Pliolite 5352 in terms of its expected effect on the market and expressed his belief that the product will have a decided impact within foam rubber manufacturing areas. He explained that at the moment, Pliolite 5352 is the most advanced synthetic rubber latex for foam yet developed and that the firm, in response to a dynamic market, will continue to improve its product. Price was cited as an extremely important consideration inasmuch as the new product "will be priced as much as 20 to 30 per cent below the current price for natural latex and is comparable to the price of ordinary synthetic latices."

Mr. Thies then discussed the growth of the latex market during the last decade. Sales of both natural and synthetic latex, he said, have increased to 154,000 long tons from 58,000 long tons ten years ago. Sales of latex for foam, which amounted to 30,000 long tons ten years ago, will reach more than 74,000 long tons this year. Pliolite 5352 is also expected to find new applications, one of which is as a substitute for natural latex for backsizing in the textiles field. Overseas markets were cited as good possibilities for the new latex. Mr. Thies said "overseas reception of the new latex has been so favorable that a large part of our production is earmarked for overseas shipment."

Mr. Pauley evaluated the development of the new synthetic latex from the point of view of Goodyear's Foam Products Division, where it is used as the principal ingredient for Airfoam. The function of that division, he said, is to fill a volume of space with cushioning materials and to provide an enduring, satisfactory "feel" for cushioning comfort. After giving a brief background of the development of Pliolite 5352, he listed its advantages.

According to Mr. Pauley, the basic raw material and its accompanying market prices will be stabilized; the new synthetic latex has more uniform quality; a constant source of supply will be available; and tests show that the division's product, made with this latex, will afford the consumer a better aging and improved hygienic end-use product. He discussed the price advantage of the material and then stated, "We are convinced this new latex provides us

the opportunity to use a basic raw material which will give the American public the best cushioning material available at the most economical cost."

Mr. Rogers discussed the historical and technical aspects of the newly developed latex. He stated that previous synthetic rubber latices developed for use in foam rubber have properties which make them suitable for only a partial replacement of natural rubber latex. The new product is markedly different from these other latices for foams. "Goodyear's Pliolite 5352", he said, "is similar to other synthetic latices used for foam rubber only in the two basic raw materials used in building its chemical structure . . . butadiene and styrene." Using flasks of Pliolite 5352, natural rubber latex and the most commonly used synthetic latex on the market, Mr. Rogers demonstrated some of the differences between the materials.

Properties of Pliolite 5352 which were listed as advantages were: less shrinkage of the foam during processing; high rubber hydrocarbon content and a lower percentage of non-rubber materials; low gel content; excellent mechanical stability; freedom of coagulum; and low surface tension. He said, "Foam rubber made entirely from Pliolite 5352 latex has greatly improved long term aging properties, light color and a pleasing neutral odor." Showing samples, he closed his talk with a brief comparison of vinyl foams, polyether-urethane foams, foams made from all synthetic Piolite 5352, and foams made from a blend of natural latex and Pliolite 5352.

Goodrich To Provide Space Suit

► B. F. Goodrich Co., Akron, Ohio, will provide the outer garment for the first American in space, it was announced by the National Aeronautics and Space Administration in Washington, D. C. The NASA plans to purchase 20 of the pressure suits at a total cost of about $75,000. The outer space suit is a modified version of the outfit which Goodrich makes for the Navy Department. According to NASA, the 20 suits will be used by the Mercury Astronauts, the seven servicemen in training for the first space flight, during brief test flights in the nose of a Redstone rocket and again when they are shot into orbit around the earth by Atlas rockets.

Beneath the pressurized suit, the astronaut will wear a double-walled rubber garment similar to that used by Air Force pilots. Air will flow into the rubber garment through a waist connection, circulate through the suit and be exhausted through a pipe in the helmet on the space suit. The Goodrich-fashioned outer suit will be pressurized only in an emergency. It will serve as a back-up safety feature should anything go wrong with the inner pressure system. The suit, made from nylon coated with neoprene will have an additional coating of silver spray which will act as an additional heat buffer and radiation shield.

Also available MODEL B-21 for measuring impact resistance of thin films

The PLASTI-DART instrumented DART-DROP tester, Model E-35, is another development of the Plas-Tech Equipment Corporation, pioneer in the field of high-speed test equipment.

THE PLASTI-DART Model E-35 was designed to obtain a quantitative measure of absorbed, transmitted, and rebound energy characteristics for a wide range of materials including elastomers, foams and other cushioning systems.

This is achieved by dropping a dart equipped with removable weights onto a test specimen previously mounted over a transducer. The transducer signal is fed into the Y axis of an oscilloscope and a load-time curve is obtained as an oscilloscope trace.

An immediate record of the load-time curve is photographed by means of a Polaroid-Land camera attached to the oscilloscope face.

Further information will be supplied on request.

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Names in the News

Dr. Carl O. Tongberg, formerly president of the Jersey Production Research Co., has been elected executive vice-president of the Esso Research and Engineering Co. **R. C. Curtis,** formerly executive vice-president of Jersey Production, succeeds Mr. Tongberg as president.

Grant E. Stueber, formerly development supervisor, has been promoted to manager of chemical process development at the Avon Lake Development Center of B. F. Goodrich Chemical Co.

Dr. M. W. Tamele has retired from the Shell Development Co. after more than 30 years of service at the firm's Emeryville Research Center.

Joseph R. Crosby has been named administrative vice-president in charge of manufacturing for the Chicago Rawhide Manufacturing Co.

Drs. Charlotte Kraebel and **Frank Donat** have joined the Chemical and Plastics Research Department at the B. F. Goodrich Company Research Center.

D. E. Hager has been named factory manager at the Akron plant of the Mohawk Rubber Co.

Finis C. Whitfield has been appointed sales representative for the B. F. Goodrich Chemical Co., covering the area of southern Ohio, southern Indiana, Kentucky and Tennessee.

Douglas M. Stuart has been appointed to the sales staff of Jefferson Chemical Co., Inc.

Fred C. Williams, Jr., previously branch manager of the St. Louis office for Wellington Sears Co., has been assigned as branch manager of a new general line office in Akron, Ohio. He succeeds **Harold F. Proctor,** who is retiring after 47 years of service. **Robert Engblom** has been named to succeed Mr. Williams in St. Louis.

Gale F. Muchmore has been appointed to the newly-created post of manager of rubber and solid-vinyl sales for the Mastic Tile Corp. of America.

Charles E. Brookes has been named manager of marketing of the Organic Chemicals Division, Dewey and Almy Chemical Division.

Harlan J. Hauser has been appointed manager of field sales for Farrel-Birmingham Co., Inc., succeeding **D. Wheeler Clark.**

Russell DeYoung, president of Goodyear Tire & Rubber Co., has been named 1960 chairman of the sponsoring committee of the Future Farmers of America Foundations.

John G. Ragsdale, director of advertising and sales promotion for General Tire & Rubber Co., has been appointed assistant to the vice-president, sales, for General Tire.

Charles L. Novak and **Thomas T. Wisner** have been appointed sales representatives for the Titanium Pigment Corp., a subsidiary of National Lead Co.

Noyes Richey has been appointed associate professional chemist by Texas Butadiene & Chemical Corp.

Dr. Charles C. Killingsworth, director of the Labor and Industrial Relations Center at Michigan State University, has been appointed national umpire for the Goodyear Tire & Rubber Co. and the United Rubber Workers, AFL-CIO.

Peter J. Horan has joined the Pigment & Chemical Co., Ltd., as Montreal sales representative.

William H. White, treasurer of Raybestos-Manhattan, Inc., has been elected a director of the company.

Dr. Donald Rivin has joined Godfrey L. Cabot, Inc., as a research chemist in the Carbon Black Technical Department. **Frank E. Daley** has been named development manager of Cabot's Minerals & Chemicals Division. **William F. Slade,** previously with the Boston office of Cabot's Minerals & Chemicals Division, has been transferred to Cleveland, Ohio, as a sales representative.

Dewey F. Gross has been appointed sales manager for Fisk tires by the U. S. Rubber Co.

Richard B. Steinmetz has been elected president of Anaconda Wire & Cable Co., succeeding **William E. Sprackling** who has retired but remains as a director of the company. **William H. Benton,** general manager of mills, has been elected to the board of directors of Anaconda Wire.

William G. Burket has been appointed chief engineer of truck tire design for Goodyear Tire & Rubber Co. He succeeds **J. E. McCarty,** who has retired.

John A. Aron, formerly with U. S. Rubber International Co., has been named assistant export manager for General Tire & Rubber Co.

Dr. C. C. Schulze, formerly manager of manufacturing of the Dyestuff and Chemical Division of General Aniline & Film Corp., has been appointed to the newly established post of assistant general manager of the division.

George Lenhart, superintendent of Plant 2 of Wilson Rubber Co., has been appointed assistant to the president. **Elwyn H. Becker** has been named chief chemist of Wilson Rubber; **John Yacos, Jr.,** is now acting superintendent of Plant 1; and **William S. Zimmerman** has been named assistant superintendent of Plant 2.

Robert T. Croysdale, previously with Ace Rubber Products Corp., has been named vice-president, manufacturing, for Anchor Industries, Inc.

Ted A. Rohlfsen has been appointed manager of the South Pacific Coast Division of Oakite Products, Inc. He succeeds **J. C. Leonard,** who has retired after 35 years of service with the company.

Robert G. Francis, formerly factory manager of U. S. Rubber's tire plant at Eau Claire, Wisc., has been appointed assistant production manager of the firm's Tire Division.

R. E. Bagby has been named Chicago district sales manager for Firestone Synthetic Rubber & Latex Co.

Zane R. Thomas has been named manager of commodity costs and billing for B. F. Goodrich Aviation Products, a division of B. F. Goodrich Co.

Edward V. Ecklund has been elected assistant treasurer of the Acme-Hamilton Manufacturing Corp.

John L. Shortley has been appointed manager of the Patent Department of Hewitt-Robins, Inc.

Leland D. Cobb has been elected president of Continental Engineering Corp., and **Arthur J. Wasley** has been elected chairman of the board of directors.

John S. Hanse, previously Los Angeles Division sales manager for General Tire & Rubber Co., has been named national trade sales manager for tires. He succeeds **L. L. Higbee,** who has been named General Tire's Western regional sales manager. **Earl H. Schaub** succeeds Mr. Hanse in Los Angeles.

Charles G. Turner, Jr., has been appointed purchasing agent for O'Sullivan Rubber Corp., succeeding **William O. Grove** who has joined Victor Products Corp.

Rial S. Potter, Jr., previously with KBC Industries, has joined Spencer Rubber Products as chief chemist.

Karsten Asks Cooperation

► Cooperation between all elements of the rubber industry will create an atmosphere in which everyone concerned will benefit, according to H. T. Karsten. Mr. Karsten, who is a director of United Baltic and East Asia Co. and a member of the British Rubber Development Board, recently spent several weeks in the United States. In a talk made in New York City on October 26, Mr. Karsten, who has attended most of the meetings of the International Rubber Study Group since their inception in 1945 as head of the Danish delegation, asked for cooperation between producers of natural and synthetic rubber. Referring to the current high price of natural rubber, he emphasized that the producers have very little influence on these prices and, further, that the more sensible producers were not happy with them. He stated that natural rubber producers were aiming their guns at greater production at lower costs, and predicted that estate yields of 1000 to 1500 pounds per acre would be achieved within the next ten years.

Mr. Karsten also reiterated the three-point plan of the producers in Malaya, namely: (1) Betterment of trees; (2) Production of new kinds of rubber, and (3) Closer cooperation between producer and consumer. He indicated that the producers of natural rubber were not overly concerned with the decision to reduce the American and British stockpiles, because they firmly believed it would be done in a sane and sensible manner over a period of years. He further stated that natural rubber producers were not too greatly concerned over synthetic rubber itself, except that in some countries nationalistic feelings may apply once synthetic rubber production facilities are established in these countries. Referring to expanding uses of rubber in general, Mr. Karsten said that natural rubber interests were keenly disappointed in the slow progress of rubber in roads. Among other achievements, Mr. Karsten has served in the past as chairman of the Rubber Growers Association in London.

Southern Ohio Holds Symposium

► The Southern Ohio Rubber Group held a symposium on "Latest Developments in Rubber Processing Equipment" at its Fall technical meeting on October 8 at the Gibbons Hotel in Dayton, Ohio. The meeting was attended by 106 persons. The subjects discussed at the symposium were "Mills, Banburys, and Automatic Take-Off Equipment" by D. C. Chase (Farrel-Birmingham); "Continuous Curing of Rubber Extrusions" by Robert H. Kline (Robert H. Kline & Associates); and "Molding Equipment and Presses" by L. E. Soderquist (McNeil Machine & Engineering). Following Mr. Soderquist's talk, a movie was shown on recent applications of completely automatic operations of molding equipment.

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Completely automatic, trouble-free performance. Dependable, quality production. Speediest installation. Least downtime (Sargent's exclusive design means easiest, quickest cleanout). Rugged construction. Incorporates every modern safety device. Designed for steam, extended surface heating elements, electric strip heating, or for added economy in natural gas areas, gas fired, direct or indirect. (Sargent pioneered the first successful gas-fired synthetic rubber dryer.) Advanced engineering by men who respect your requirements — A Sargent is Modern for Years to Come.

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Financial News

Witco Chemical

► Nine months ended September 30: Net income of $1,545,300, which is equal to $2.03 per share, compared with $1,179,400, exluding a non-recurring item, or $1.86 per share, in the comparable period of 1958. Sales and other income in the first nine months of 1959 totaled $38,597,200, compared with $29,196,700 in the same period last year.

American Enka

► Nine months to September 29: Consolidated net income of $5,287,000, or $3.99 per share, compared with $154,000, or 11c a share, in the same period of 1958. Consolidated net sales in the first nine months of 1959 totaled $76,655,000 compared with $42,490,000 in the equivalent period of the preceding year.

Heyden Newport

► Nine months to September 30: Net income of $2,104,000, which is equal to 90c per common share, compared with $1,121,000, or 40c a share, in the same period last year. Sales in the 1959 nine month period totaled $41,993,000, compared with $35,334,000 in the equivalent period of the preceding year.

Monsanto Chemical

► Nine months to September 30: Net income of $48,377,000, which is equal to $2.14 per share, compared with $28,148,000, or $1.27, in the 1958 nine month period. Net sales in the first nine months of 1959 totaled $613,188,000 compared with $519,705,000, in the equivalent period of the preceding year.

American Cyanamid

► Nine months to September 30: Net income of $40,028,000, which is equal to $1.89 per share, compared with $27,915,000, or $1.32 a share, in the same period last year. Sales in the 1959 three quarter period totaled $442,007,000, compared with $388,329,000 in the similar period of 1958.

Firestone

► Nine months ended July 31: Estimated net income of $44,675,914, which is equal to $5.18, compared with $35,118,046, or $4.16, the year before. Sales in the nine month fiscal period totaled $847,453,946, compared with $759,719,839, in the same period last year.

Midwest Rubber Reclaiming

► Nine months ended July 31: Net income amounted to $853,011, equal to $2.32 per share, compared with $531,852, or $1.40 per share, which was adjusted for a 25 per cent stock dividend in November, 1959. Net sales for the 1959 period totaled $9,512,688, compared with $6,848,407 for the 1958 period.

Baldwin Rubber

► Year ended June 30: Net income amounted to $675,508, which earned $1.55 per share of common stock, compared with $387,437, or 91c for the same period a year earlier. Net sales totaled $18,978,591, compared with $15,183,367 for the previous fiscal year.

Lee Rubber

► Nine months ended July 31: Net income amounted to $1,079,907, equal to earnings of $1.26 per share of common stock, compared with $1,184,858, equal to $1.40 per share for the like period a year ago. Net sales totaled $37,662,253, compared with $32,747,548 for the 1958 period.

Polymer Corp.

► Six months ended June 30: Net earnings of $229,126, equal to 33c per share of common stock, compared with $11,339 reported for the same period a year ago, which earned 2c per share. Net sales totaled $3,280,780, compared with $2,086,178 for the like period of 1958.

Dayton Rubber

► Nine months ended July 31: Net earnings totaled $1,816,301, equal to $1.64 per share, compared with $819,141, or 73c a share for the like period a year ago. Sales for the nine months period amounted to $71,802,930, compared with $60,550,983, for the 1958 period.

General Cable

► Nine months ended September 30: Net income of $6,394,806, which is equal to $1.98 a share, compared with $5,249,793, or $1.61 in the 1958 nine month period.

DeVilbiss

► Nine months to September 30: Net income of $1,299,296, which is equal to $1.79, compared with $460,140, or 63c in the same period of the preceding year.

Goodrich

► Nine months ended September 30: Net income of $28,820,709, which is equal to $3.20 per common share, compared with $23,411,892, or $2.61 a share, in the 1958 nine month period. Sales in the first nine months of 1959 totaled $578,478,605, compared with $508,465,253 in the same period last year.

General Tire

► Nine months ended August 31: Estimated earnings of $20,320,567, which is equal to $3.79 per share of common stock, compared with $5,331,368, or 91c, in the 1958 period. Sales in the first nine months of fiscal 1959 totaled $483,644,239, compared with $321,405,954, in the same period last year.

Seiberling

► Six months ended June 30: Net income for the half amounted to $754,953, equal to earnings of $1.24 per share, compared with $48,729, equal to a 9c deficit, for the like period a year ago. Net sales were $26,968,925, compared with $21,411,670 reported for the first half of 1958.

Armstrong Cork

► Nine months to September 30: Net income of $15,257,000, which is equal to $2.94 per share, compared with $9,534,000, or $1.82 a share, a year earlier. Sales in the first three quarters of 1959 amounted to $219,213,000 compared with $182,658,000 in the same period last year.

Long Mile Rubber

► Quarter ended August 25: Net income of $220,624, which is equal to 35c per share. Net sales in the third quarter of 1959 totaled $2,255,740. Because of recapitalization figures for the comparable 1958 period are not available.

National Vulcanized Fibre

► Quarter ended September 27: Net income of $295,000, which is equal to 45c a share, compared with $159,000, or 28c a share, in the third quarter of 1958. Third quarter sales totaled $5,697,000 compared with $3,686,000, in the same period last year.

Triangle Conduit

► Eight months ended August 31: Net income of $1,761,690, which is equal to $1.30 per share, compared with $1,496,848, or $1.10 a share in the first eight months of 1958. Gross sales in the 1959 eight month period totaled $46,242,756 compared with $38,898,356, in the same period last year.

Southern Rubber Group Holds Fall Meeting on October 9-10

► Registration at the Fall Meeting of the Southern Rubber Group held on October 9 and 10 at the Peabody Hotel, Memphis, Tenn., totaled 205 members and guests who gathered for an interesting technical program and banquet. The meeting got underway on Friday afternoon, October 9 with a business session presided over by Chairman Eldon H. Ruch (Firestone). It was announced that group membership now totals 371.

R. L. Turpen (Bowling Green Rubber), chairman of the Auditing Committee, reported that an audit of the group's books revealed that all was in order. Martin Samuels (Copolymer) indicated that as of October 1, 1959, the group had over $2,000 in the treasury.

It was also announced that Warren S. Hall (C. P. Hall), Charles M. White (Cabot Carbon), and Roswell C. Whitmore (Better Monkey Grip) have been appointed as a Nominating Committee for the purpose of selecting candidates for the next election of officers. Chairman Ruch announced that a committee will soon be appointed to examine the by-laws of the organization to see if any revisions are indicated at this time.

The Memphis meeting of the Southern Rubber Group represented the tenth meeting of the organization and the start of its fourth year. Incidentally, the Spring, 1960, meeting of the group will be held in Birmingham Ala., instead of in Atlanta, Ga., as previously announced.

Technical Program

The technical session on Friday afternoon was devoted to a panel discussion of Materials and Process Control moderated by Jeff W. Hart (Firestone). Panel members and their subjects included:

E. W. Kiel (Goodyear) — "Advantages of Different types of Systems for Handling Materials in Process."

R. H. Zabel (DuPont)—"Pigmentation in Rubber."

E. J. Valois (Texas-U.S. Chemicals) —"Gel Formation in SBR."

G. C. Maassen (R. T. Vanderbilt)— "Processing Control of Rubber Chemicals."

The technical session on Friday afternoon was followed by a Supplier's Hospitality Hour and this, in turn, was followed by a banquet at which Travis Butler (American Rubber) delivered the invocation. G. R. McCalla (J. E. Dilworth) served as master of ceremonies. Roger Pfau (Texas-U.S. Chemicals) delivered a welcoming address and introduced those seated on the dais to the audience. Some 215 members and guests were in attendance at the banquet.

A feature of the occasion was the presentation of the "Man of the Year Award" to William F. Gerrow, Jr. (Goodyear Chemical), for his efforts on behalf of the Southern Rubber Group. Thomas R. Brown (Goodrich) presented a cup to Mr. Gerrow. Warren S. Hall (C. P. Hall), past-chairman of the group, was presented with a plaque in recognition of his services.

Dr. J. P. McKenzie (Copolymer) presented the Harmon Connell Scholarship award, an annual presentation, to Frank Fay McKay, Jr., senior at Mississippi State University. The Harmon Connell Memorial Scholarship was established by the group at Mississippi State to honor the memory of Harmon Connell, first chairman of the Southern Rubber Group.

The after-dinner speaker at the banquet was Dr. Ross Pritchard of Southwestern University, Memphis, who delivered an interesting talk on "Capitalism and National Security in the United States."

On Saturday morning, October 10, the technical portion of the meeting continued with a talk by S. Everett Perlberg (Adamson United) on "Advanced Rubber Processing Equipment and Methods."

D. A. Reneau (United Carbon) served as chairman of the Housing Committee for the Memphis meeting, while Lenoir Black (C. P. Hall) was hospitality representative. Committee chairmen for the 1959-60 year include: *Membership*—R. N. Golden (Sun Oil); *Program* — Roger Pfau (Texas-U.S. Chemicals); *Education*—J. P. McKenzie (Copolymer); *Publicity*—C. H. Edwards (Phillips Chemical).

On Saturday morning, October 10, Mr. Perlberg presented his interesting discussion of "Advanced Rubber Processing Equipment and Methods." Following the generalization that new tire plants were designed around calenders and mechanical goods plants around curing capacity, a review of intensive mixers was made. This included the comparison of a kneading action in the Intermix as compared with the smearing, or wiping action, in sigma blade type units. The advantage of mounting the rotors on fixed centers by means of roller bearings, outboard of the main housing, was pointed out. Also noted was the advantage of a large area ram in allowing variable batch sizes and permitting programming of the mixing cycle by means of pressure regulation.

The comparison of a drop type gate, which permitted leakage, compared with a slide gate, which produced "rat-tails", was made. Another point reviewed was the probability of single pass mixes in new style intensive mixers including breakdown, masterbatching, injection of oils and plasticizers and, finally, the addition of curing agents and accelerators. This probability is already a fact in some plants and, with better control of heat transfer in intensive mixers, is very likely to be accepted in additional plants.

He discussed intensive mixers to sheet off equipment through extruders with their advantages in reducing manpower, providing constant dispersion with the same formulation and production of a sheet or profile. Their disadvantages of requiring a different screw design for each formulation, problems in cooling and low operating efficiency, mitigate against this application for all but a few large volume single type products, Mr. Perlberg said.

In discussing mills, mention was made of integral base design, incorporating end frames and bedplate as an integral casting, as well as the use of vibration dampeners, the elimination of expensive foundations and anchor bolts. Conventional mills have been built utilizing this principle and making their removal from an existing site quite easy.

Other developments in mills, such as the use of drilled rolls with circulating water systems, flood lubrication, labyrinth seals, the use of individual rather than line shaft drives, and the problems in designing connecting gears for adjustable openings were discussed. The use of mill aprons, slitter knives, scraper blades and motorized adjusting screws were reviewed.

Summarizes Calender History

A summary of calender history was made, including designs of tilted "Z" types built during the late 1800's. well as the mistake of buying 3-roll calenders when only a 2-roll calender is needed. The use of "Roll Bending" between pairs of rolls to multiply its effect, and the use of roll crossing with and without connecting gears was recommended for all calenders. A working model of the Adamson United patented connecting gear design was shown.

Progress in calender design since the war was reviewed, including roll temperature control, individual screwdowns, Beta Ray gauge control, flood lubrication, bearing temperature control and constant tension variable speed DC drives.

Emphasis was put on proper calender design such as 120° calender with its safety and gravity feed advantages as

a 3-roll unit and "Z" type calenders for double coating. A listing of all the various types of calenders which have been built and operated, with a brief description of each, followed. The final outline included a 5-roll theoretical unit which could be an "L"—"Z" or 3-roll calender.

After a review of all the above points with slides, the program was shifted to the curing section, other than individual tire curing presses. An outline was given of "CV" machines, including the catanary tube design. This was compared with tank-type vulcanizers and special emphasis was put on safety in design of quick opening doors. The flange and groove arrangement, as used in the patented "Lift-Swing" door or the side-slide, or straight up, or up and over design was shown to be much safer than a breech-lock vessel.

Discusses Press Developments

In a discussion on presses, emphasis was put on the rotary curing units, including such equipment as was built by "Gora-Lee", the Ferris-Wheel design of Adamson United Co., and other rotary units. The use of the "Rotocure," the unit built under license from Boston Woven Hose & Rubber Co., was described in some detail. The review included the basic design plus the addition of more than heat, the use of a secondary pressure roll, and the two-band machine which was mentioned.

Then came a review of new developments in flat bed press design, including the prestressing of rods to approximately 10 per cent over their rated load, the development of the curved side-plate or "barrel" press for high density molding and for high clamping pressures in transfer molding.

A slide showing a "window-frame" press which is usually the most competitively designed press for a given application was shown, and the advantages of uniformly loaded strain members was pointed out. In a review of automatic presses, advantages and disadvantages of the mechanical crank type "McNeill's" were brought up. Operating designs of items such as temperature compensating guides and ram diameters, and hydraulic line pressures were briefly mentioned.

The speech closed with a description of the "squat-heater", the new single mold heater press for large tires, and the possible in-field future use of this equipment for recapping and rebuilding off the road tires at the site.

Dow Chemical Plans New Unit

► Dow Chemical Co., Midland, Mich., will build a plant for the manufacture of styrene-butadiene synthetic rubber latices at Allyn's Point, Conn. Production is scheduled to start early in 1961. The company also plans to expand its styrene-butadiene latex capacity at Freeport, Texas.

Samuel R. Phillips

Named General Manager

► U. S. Rubber Co., New York, N. Y., has announced that Samuel R. Phillips has been named general manager of Latex Fiber Industries, Inc., a subsidiary of U. S. Rubber and jointly operated with J. P. Lewis Co., at Beaver Falls, N. Y. Mr. Phillips previously was assistant general manager of the Textile Division of U. S. Rubber. He graduated from Georgia Tech in 1938 and joined U. S. Rubber in 1939 at its Hogansville, Ga., plant where he worked in the testing laboratories. Three years later he was an assistant in the Production Scheduling Department when that department was transferred to New York City. In 1944, Mr. Phillips served with the United States Navy, rejoined the company in 1946, and later that year was appointed assistant manager of sales and production coordination for the Textile Division. In 1948, he became manager of sales and production coordination and, in 1951, he was named assistant general manager for the Textile Division.

Wins William H. Nichols Medal

► Professor Herman F. Mark of the Polytechnic Institute of Brooklyn, world authority on macromolecule chemistry, has won the 1960 William H. Nichols Medal of the American Chemical Society's New York Section. The gold medal, which is conferred annually to stimulate original research in chemistry, will be presented at a section dinner in March. Dr. Mark will receive the award for research conducted and reported during the past five years. He will be cited for "his brilliant advancement of polymer science toward useful ends through pioneering theoretical and experimental development of new concepts of molecule architecture and macromolecule chemistry; for inspired communication of polymer developments through teaching, writing, editorship, and personal contact affecting a continued widespread growth of mature understanding of large molecules."

ASME Plans Two Sessions on Rubber and Plastics

► Two technical sessions on rubber and plastics have been scheduled to take place during the annual meeting of the American Society of Mechanical Engineers, which will be held during the week of November 30 to December 4 at Chalfonte-Haddon Hall in Atlantic City, N. J. Highlights of the ASME meeting will include an "Early Bird" party; a hotel concert; special luncheons; a variety show; dances and field trips. An interesting ladies' program has also been planned. On Thursday, December 3, there will be a banquet followed by a dance.

The rubber and plastics sessions will be held during the morning and afternoon of Monday, November 30. Papers to be presented during the first session include:

Uniform Two-Way Orientation of Plastic Films, by M. O. Longstreth and Turner Alfrey, Jr. (Dow Chemical).

Videne—A New Polyester Laminating and Surfacing Film, by C. W. Taylor (Goodyear).

Plastics in Construction and Agriculture, by T. E. Werkema (Dow Chemical).

Plastics Developments: 1958-1959, by Lois W. Brock (General Tire).

The afternoon session has been scheduled to begin at 2:30 p.m. and will feature the following papers:

Plastic-Pipe Standards, by Gordon Kline (National Bureau of Standards, Department of Commerce).

Polyethylene Pipe Progress, by Alfred Stockfleth (DuPont).

Factors Affecting the Long-Term Performance of Polyethylene Plastic Pipe, by W. P. Acton (Hercules Powder).

Rubber Developments: June 1957-June 1959, by Leora E. Straka (General Tire).

Goodrich Building Retread Plant

► B. F. Goodrich Tire Co., a division of B. F. Goodrich Co., Akron, Ohio, has announced that construction has begun on its new retread plant near Oakland, Calif. According to the company, the new plant will triple the firm's present capacity for tire retreading in the San Francisco Bay area, and will serve motorists and truckers as far east as Reno, Nev. Construction of the 14,000 square-foot, one-story plant got under way in October and occupancy is expected to take place in January, 1960.

The company reports that its present retreading plant in Oakland will continue to operate at scheduled capacity until the new plant is completed. It will then be replaced by the new facility. Installation of modern equipment and additional presses and a greater number of matrices will give the new plant a production capacity of 9,000 tire retread units a month.

Rubber and Plastics Studies

► Three U. S. Navy and Army Ordnance reports on studies of rubber and plastics are now available from the Publications and Public Information Division, Office of Technical Services, U. S. Department of Commerce, Washington 25, D. C. The publications cover the effects of some plastics and rubbers on metal corrosion, a pendulum-type tester for measuring the impact resistance of plastics, and an investigation into the tensile properties of three thermoplastics.

The Corrosivities of Plastics and Rubbers, by H. A. Perry, Jr., and his associates at the U. S. Naval Ordnance Laboratory, details three techniques for testing the corrosive effect of plastics and rubbers on metals in humid surroundings. A method which permits identification of water-soluble ionic constituents contributing to galvanic corrosion is recommended for use with thermosetting or thermoplastic organic resins, inorganic or organic plastic fillers, laminates, adhesives, and both natural and synthetic rubbers. The 41-page report is designated as PB 151750 and priced at $1.25.

The Raleigh-Edwards-Tensile-Impact-Machine-Pendulum for measuring the impact resistance of plastics is described in detail in the 35-page study entitled *Impact and Shock Resistance of Plastics: Final Report.* It was prepared by North Carolina State College for the U. S. Navy's Bureau of Ships and enumerates how this simple tester can be used at numerous energy and velocity levels to facilitate investigation of impact resistance as a function of these two variables. Requests for PB 151729 should be accompanied by $1.25.

R. E. Ely's *Tensile Properties for Three Thermoplastics Over Six Decades of Rate* is a 75-page study describing work done at the U. S. Army Ordnance Corps' Redstone Arsenal on investigating the tensile properties for polyethylene, ethyl cellulose, and polymethyl methacrylate. Included in this report, designated as PB 151573, are some data for ultimate strains and elastic moduli. The price of the publication is $2.00.

Cary Acquires Regency Plastics

► Cary Chemicals Inc. of Flemington and East Brunswick, N. J., has announced the formation of Regency Plastics Inc. to acquire the business and assets of Regency Plastics Co. of Woodside, L. I., N. Y. The integration is expected to provide a well-established finishing facility for Cary Chemicals' other subsidiaries, including Great Bay Plastics & Chemical Co., East Brunswick, N. J., which was scheduled to go on stream about November 1. Great Bay will produce vinyl sheeting from Cary Blacar resins and will feed it to Regency Plastics for printing, embossing and laminating. Regency's present operations include extrusion, intaglio printing, gravure printing, vacuum embossing, laminating, etc., Cary said.

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Product Research and Development—A few years ago Snell was retained to develop new products, applications, and markets for sugar. Extensive research and development work by Snell resulted in the creation of a new synthetic detergent—based on *sugar!*

Product Application—A Snell client in the paper industry, for whom we had developed a fine additive, wanted to explore uses in other fields. Unfortunately, their highly qualified staff's experience was limited to the one field. Snell, with experts in practically every product field, found the new product has potentialities as both a good emulsifier and a paint plasticizer. Only the very largest manufacturing companies can duplicate the breadth of experience and background the Snell "brain-trust" of technical experts can offer you!

Product Improvement—One Snell client found their product, an adhesive bandage, slipping in quality. Tape was going gooey in storage on druggists' shelves. Snell research helped this client bring his product quality up to equal the best on the market, and retain his share of sales.

Product Evaluation—A Snell brewery client wanted to expand production and take advantage of a more efficient production technique but feared the taste of the beer might suffer. Snell food technologists, taste panels, and engineers checked the new process and hundreds of samples of beer made under new and old systems, recommended the switch to the more profitable modern process. The change went unnoticed by the customers, and sales continued to climb.

Market Research—A Snell client with a waste product had briefly considered building a plant to use it to manufacture another product; but had given up after their own brief survey showed the new product to be already overproduced. When they consulted Snell for checking, however, Snell predicted there would be a shortage within three years. The client waited two years, built the plant—and now has a profitable new product instead of a waste!

Toxicology—One of the largest frozen food companies began getting complaints on the flavor of one of their green vegetables. Since hundreds of thousands of dollars were at stake, they consulted Snell to find out what was wrong. Snell by analyzing tests, and checking on the farm, was able to prove that the taste—actually toxic—was due to a new type of insecticide sprayed on the fields hundreds of yards away on a windy day long before the harvest!

Engineering—A large midwestern firm desired to produce its own brand of instant coffee, to possess outstanding flavor, body, and bouquet. They engaged Snell to design their extraction line, which is now economically producing a superior product, and have since doubled capacity. Since that time, two additional plants have been modified under our supervision to increase production and improve product characteristics.

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Buffalo Group Hears Talk On Technical Service Problems

► The Buffalo Rubber Group held its Fall technical meeting on October 13 at the Westbrook Hotel in Buffalo, N. Y. Robert Cowen (U. S. Rubber Reclaiming), introduced Carl E. Carlson (General Tire & Rubber) who spoke during the technical session on "Technical Service Problems." Mr. Carlson stated that in any item of manufacture, variations existed in men, machinery and materials. He pointed out that it was the function of the technical service group to reduce the variations to a livable minimum, and to adjust and correct conditions which reflect unfavorably on quality and production efficiency. Mr. Carlson discussed the organization and functions of technical service groups and described how some typical problems were handled in tire plants.

Richard Herdlein (Hewitt-Robins), chairman of the Buffalo Rubber Group, introduced Thomas F. Schifferli (Republic Steel), who was the after-dinner speaker. Mr. Schifferli's subject was "World's Biggest Highway Program." He discussed the planning and progress of the Federal highway program, including automatic vehicle guidance systems and the progress in the development of rubber roads. A question and answer period followed Mr. Schifferli's talk.

"Technical Service Problems" was the subject of the talk given by Carl E. Carlson (General Tire & Rubber) at right, at the October 13 technical meeting of the Buffalo Rubber Group. With Mr. Carlson are, left to right, Robert Cowen (U. S. Rubber Reclaiming) and Richard Herdlein (Hewitt-Robins), group chairman.

Time Study Clinic Held

► Walley & Associates, management consultants, Dayton, Ohio, held a time study and wage incentive clinic for rubber industry personnel on October 26 to 28 at the Miami Hotel in Dayton, Ohio. The three day clinic was conducted and under the direction of John R. Walley. The topics under discussion during the 12 clinic sessions were: What management in a rubber products plant expects from time study; Why use standard elemental data in a plant producing rubber products; Arrangement of time studies for standard elemental data; Development and application of standard time tables; Development of wage incentives when manufacturing rubber products; Case studies in developing incentives on rubber products manufacturing operations; Installation of wage incentives; Maintenance of wage incentives; When should a wage incentive plan be revised?; Ten principles in successfully revising incentive plans; and Getting the most out of time study and wage incentives.

U. S. Rubber Kralastic MM

► Naugatuck Chemical Division of the U. S. Rubber Co., Naugatuck, Conn., has developed what is said to be a tough new plastic that can be engineered precisely. Kralastic MM, the new material, is a resin-rubber blend specifically designed for molding products where high rigidity and resistance to cold flow under loads are required. The company says that lab tests indicated that the medium-impact plastic is more rigid and has less tendency to creep or flow under load than any thermoplastic material now being marketed.

According to U. S. Rubber, the new plastic has low moisture pick-up, good impact strength and high abrasion and corrosion resistance. It will withstand heat, while maintaining usable strength, up to 200°F. It is available in a range of colors and parts molded from it are said to have good gloss. The molded parts can be painted, printed and cemented with solvents, according to the company.

R-M Names Factory Manager

► Wilder E. Perkins has been appointed factory manager of the Manhattan Rubber Division of Raybestos-Manhattan, Inc., Passaic, N. J. Previously manufacturing general co-manager with R. J. Gorecki, who resigned recently, Mr. Perkins graduated from Massachusetts Institute of Technology as a mechanical engineer. He has been with Manhattan since 1926. Other company appointments include A. J. Van Benschoten, director of purchases; and G. Hellerman, manager of traffic and transportation.

► Elastomer Chemicals Department of E. I. du Pont de Nemours & Co., Inc., has issued bulletin BL-354, a study of "Blends of Neoprene Types WB and GN."

W. R. Grace Appoints Three

► The Research Division of W. R. Grace & Co., New York, N. Y., has announced the appointments of Drs. Fred Jaffe, Clifton L. Kehr and A. D. Ketley to the staff of its Washington Research Center, Clarksville, Md., as research chemists. According to the company the three appointees will be primarily concerned with polyolefin research. Dr. Jaffe graduated from Western Reserve University in 1953 and received his Ph.D. in 1957 from Cornell University. Prior to joining Grace, he completed a year of post-doctoral work at Cornell. He is a member of the American Chemical Society and the Chemical Society of London.

Dr. Kehr is a graduate of Gettysburg College, and received his M.S. and Ph.D. in 1950 and 1952 respectively, from the University of Delaware. Prior to joining Grace, Dr. Kehr was engaged in elastomer research and development for DuPont. He is a member of the Organic Division of the American Chemical Society. Dr. Ketley was associated with the Georgia Institute of Technology and the Esso Research & Engineering Co. as a research chemist prior to joining Grace. Previously, he was assistant professor in organic chemistry at the University of Sydney in Australia. Dr. Ketley has published technical papers in the United States and England.

Seiberling Elects Rodman

► Seiberling Rubber Co., Akron, Ohio, has elected M. R. Rodman as assistant treasurer and has re-elected all officers except H. E. Thomas, assistant secretary-treasurer, who has retired. Mr. Rodman, who will continue to serve in his capacity as manager of the Credit Department, served as assistant credit manager and manager of the company's district sales offices in Kansas City and Chicago before he was named credit manager.

Officers re-elected include J. P. Seiberling, *president and chairman;* L. M. Seiberling, *vice-chairman and vice-president in charge of sales;* H. P. Schrank, *executive vice-president;* R. J. Thomas, *vice-president and treasurer;* C. E. Jones, *vice-president and comptroller;* E. A. Hensal, *vice-president in charge of production;* W. P. Seiberling, *secretary;* R. L. Perkins, *assistant secretary and counsel;* and W. T. Johnson, *assistant vice-president in charge of sales.*

Manley Named Representative

► Frank H. Manley Jr. has been named western area sales service representative for the Falls Engineering and Machine Co., Cuyahoga Falls, Ohio. In his new post, Mr. Manley will represent the firm in nine western states. A native of Niagara Falls, N. Y., he was formerly sales manager of the Abrasives Division for the Carborundum Co.

Polypropylene Unit on Stream

► AviSun Corp., Philadelphia, Penna., has begun operations at a new 20 million pound per year unit for the production of polypropylene at Port Reading, N. J. The new commercial unit, a converted polyethylene line at the Koppers Co., Inc., is operated by Koppers personnel under the technical direction of AviSun, which leases the facilities from Koppers. AviSun, an equally owned affiliate of American Viscose Corp. and the Sun Oil Co., was formed in February of this year to manufacture and market polypropylene polymer, film and fiber. Pilot plant operations for polypropylene film and fiber are based in Marcus Hook, Penna., and the company is currently building a commercial plant for production of film and fiber near New Castle, Del.

The Port Reading unit uses a process which results in production of highly isotactic and crystalline polypropylene. Initially, AviSun offers two commercial grades of polypropylene; a general purpose grade for injection molders and one for extrusion of monofilaments and fibers. In addition, AviSun will offer some color formulations. AviSun polypropylene, a new thermoplastic material, is said to be the lightest commercial plastic available and to offer more product per pound of resin. Outstanding properties of tensile strength, temperature resistance, stress crack-in resistance, stiffness, film transparency and surface gloss are due to the tailored structure of the molecules, AviSun states.

Pennsylvania Tire Opens Plant

► Pennsylvania Tire Co., Mansfield, Ohio, announces that its new tread rubber manufacturing plant in Paris, Tex., is now in full production. Phillip B. Field, service-sales manager of the company's Western Division, is in charge of customer service, and Wallace Maddox is plant production manager. Initial production is geared for 750,000 pounds of tread rubber monthly. However, the new plant is designed so that it may be expanded for greater tread rubber production or enlarged to include the manufacture of passenger car and truck tires, whichever customer demands warrant.

Second Acrylonitrile Plant

► A new plant to produce acrylonitrile will be built by E. I. du Pont de Nemours and Co., Inc., Wilmington, Del., near Beaumont, Texas. Acrylonitrile is the main ingredient in the company's Orlon acrylic fiber. The Beaumont plant, the second started by DuPont this year, will manufacture acrylonitrile from ammonia and propylene. The first plant, begun in Memphis, Tenn., this June, will produce the material from hydrogen cyanide and acetylene. Expectations are that the Texas plant will be on stream in the spring of 1961. Production at the Memphis facility is scheduled to start late in 1960.

Obtains Columbia-National Stock

► Columbia-Southern Chemical Corp., Pittsburgh, Penna., has obtained the balance of the stock interest in Columbia-National Corp., previously held by National Research Corp. Under the reorganization plan, Columbia-Southern obtained all of the outstanding stock of Columbia-National. In exchange, National Research received 10,000 shares of Columbia-Southern's 4 per cent convertible voting preferred stock with a par value of $100 per share. If certain conditions are met by March 31, 1964, National Research may convert its shares of Columbia-Southern preferred to $5,000,000 worth of Pittsburgh Plate Glass Co. common stock. Columbia-Southern Chemical is a wholly-owned subsidiary of Pittsburgh Plate Glass.

Columbia-National, with plant at Pensacola, Fla., produces zirconium sponge for the Atomic Energy Commission and others. The firm was established in 1956 and has operated since 1958 with Columbia-Southern owning 50 per cent of the stock, plus one share and with National Research owning the remaining shares. Columbia-Southern reported that circumstances connected with the Atomic Energy Commission contract make it advisable to continue to operate Columbia-National as a subsidiary.

Dayton Forms New Company

► Dayton Rubber Co., Dayton, Ohio, has formed a new company in Chicago, Ill., to handle its growing line of industrial and automotive products, which will be called the Dayton Industrial Products Co. The new firm will be operated as a Dayton division and will have headquarters in a building now under construction in the Melrose Park area west of Chicago. Activities of Dayton's former Mechanical Goods Sales Division will be incorporated in the organiztation and several executives, department heads and key personnel will be transferred from present headquarters to the new location. Robert G. Burson, a vice-president of Dayton, will be in charge of the new company.

The Chicago operation will be responsible for sales, advertising, sales promotion, merchandising, product engineering and application for Dayton's automotive and industrial products. Also included will be a new line of urethane products for a variety of industrial uses and a full range of molded and extruded industrial rubber products. The new company is an outgrowth of a product diversification program launched in 1921 at which time the Mechanical Goods Division was formed. The establishment of this new Chicago operation ties in with Dayton's over-all expansion program.

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Akron Fall Meeting Features Symposium on Today's Tires

► More than 550 members and guests of the Akron Rubber Group were in attendance at the Fall Meeting of the group, held on October 23rd at the Sheraton Hotel in Akron, Ohio. The meeting featured a symposium on "Today's Tires" moderated by B. Kastein (Firestone). After the technical session and a cocktail hour, dinner was served. The after-dinner speaker was Dr. R. C. S. Young, on leave of absence from the State College of Business Administration, Atlanta, Ga., who delivered an interesting talk on the American scene. Dr. Young was introduced by Dan Doherty (Godfrey L. Cabot).

At the dinner, Milton Leonard (Columbian Carbon), chairman of the Akron Group, introduced those seated on the dais to the members and guests, V. F. Springer, chairman of the Membership Committee, reported that as of October 23 the group had 1,352 paid members. Milton J. Rhoad (Goodyear), head of the Auditing Committee, indicated that the group's finances were in good order. Charles W. Stalker (General Tire), group treasurer, reported that $3,400 was in the treasury.

A feature of the dinner program was the presentation of a placque to George Hackim (General Tire), past-chairman of the Akron Rubber Group, for his services to the organization. Mr. Hackim has been a member of the group's Executive Board for the past eight years. Mr. Hackim, now chairman of the Scholarship and Education Committee, reported that four scholarships are now being offered by the group at the University of Akron. He noted that 85 students are now pursuing the rubber technology course on raw materials at the University, and that 150 will take the course on compounding of special products. Both courses are offered at the University through the cooperation of the Akron Rubber Group.

Additions to Hall of Fame

As an interesting sidelight, Mr. Leonard indicated that additions are now being considered to the "Rubber Hall of Fame" maintained at the University of Akron. New candidates for the "Hall of Fame" are expected to be announced shortly.

The panel discussion on "Today's Tires" featured three interesting papers. T. M. Kersker (Goodyear) spoke on "Textiles", while K. R. Garvick (Mansfield Tire) devoted himself to "Compounding" and K. L. Campbell (Firestone) discussed "Design and Construction." (EDITOR'S NOTE: The complete symposium on "Today's Tires" will be published in the December, 1959, issue of RUBBER AGE).

In his talk on "Textiles", Mr. Kersker pointed out that the function of textiles in tires is to provide the tire with shape, size, stability, bruise resistance, fatigue resistance and load carrying capacity. In addition, he stated, tire fabric plays an important function in ride, noise, heat build-up, separation resistance, high speed performance, and durability.

Improved performance can be built into tires by use of textiles which utilize new cord constructions, new cord materials, new processing techniques, proper choice of optimum quantity of cord, and new tire constructions.

The speaker noted that the recent widely publicized improved rayons result from increased cord resistance while maintaining fatigue resistance. Rayon and nylon, he observed, are now competing for use in tires. Major acceptance will depend largely on price, but mostly on the quality of performance.

Discusses Compounding

K. R. Garvick, speaking on "Compounding", stated that a tire compounder develops new rubber compound recipes in a laboratory, proves their use in tires by testing on "indoor wheel" equipment and finally checks his results by evaluating a series of tires on test vehicles on the road.

Whether he uses natural rubber or synthetic as his basic material is determined by the type of tire, passenger or truck, and by the location of the stock in the tire, whether tread or body. In general, truck tires require natural rubber while best performance of passenger tires now depends on synthetic polymers. A little natural rubber is used in passenger tires to provide better factory tire building.

The selection of type of black, from the nine available, and the quantity to use, again is determined by the tire needs. Highest black loadings are used in the tread for maximum resistance to highway abrasion while much lower loadings of blacks, in the compounds for the body of the tire, give the desired resistance to separation and minimum heat build up.

The compounder must strike a balance between service requirements of the tire and the needs of the factory to have a material suitable for efficient production processing.

In his talk on "Design and Construction", Mr. Campbell declared that today's tires must give satisfactory performance on vehicles of ever increasing weight and horsepower running over ever increasing mileage of super highways. One survey in Texas showed 80 per cent of the cars on a particular highway were traveling at 70 mph or faster.

High speed and load results in the tire operating at high temperatures and stress. Both of these factors produce tire failures because of the deteriorating effect on textiles and rubber compounds. The improved strength textiles and heat resistant rubber compounds, he said, are the materials the tire engineer must combine in the right proportions to give a tire with satisfactory performance, regardless of severe operating conditions.

Passenger tire construction at the present time is largely concerned with "soft" ride, low noise level, and steering stability for maximum passenger comfort. The new "low profile" tire has been developed to provide the best possible stability, along with minimum loss of ride cushioning. Anti-noise treatment of the tire involves making the tread segments of various sizes and shapes, as cured into the tire during molding.

Service requirements are the major factors in choice of design and construction for a truck tire, he noted. A wide number of special purpose tires have been developed. Some of these have designs for maximum wear resistance and are recommended for use only on drive wheel positions. Four hundred thousand miles on original treads are possible with such tires. Other tires have designs for maximum traction and are used on vehicles operating on-and-off the highway. Cut-resistant tread compounds are a "must" for off-the-road tires in mining work or moving dirt over rocky terrain.

Radial Type Tire

One of the most interesting new truck tire developments is the radial type tire, made with only one body ply of cords arranged radially from bead to bead. A series of narrow plies under the tread form an inextensible band to maintain the tire shape. Such tires in some service give 100 per cent wear improvement over conventional tires. In order to have the best tire for each service requirement at the lowest possible cost, a company like Firestone has a line-up of 1000 tires, Mr. Campbell concluded.

► The Chicago office of Emery Industries, Inc., has moved to new quarters at 6835 W. Higgins Ave., Chicago 31, Ill. The new telephone number is Rodney 3-5747.

Paris Chemical Exhibition

► The United States Embassy, Paris, France, reports that over 340,000 visitors attended the Fifth International Chemical Exposition on June 18 to 29 in Paris. Six annual industry exhibitions were combined for the show which featured equipment for the chemical industry, chemical products, rubber and plastics, and scientific apparatus. According to the Embassy, foreign firms at the fair represented the United States, West Germany, the United Kingdom, Benelux, and Italy. A few firms represented East Germany and other Eastern European nations.

The Embassy reports that considerable interest was shown in technical seminars on such subjects as research on corrosion control, latest developments in the plastics industry, automatic chemical analysis, new aerosol vaporizers, and progress in blending paints. Some of the exhibits which attracted particular attention were a direct reading apparatus for the analysis of metals contained in steel alloys; radiation detector for all climates; scale model of a new refining process for solid salt; a binder which can make invisible and airtight joints; and stratified products with glass fiber and polyester bases used to make gutters.

New Tread Rubber Compound

► Mohawk Rubber Co., Akron, Ohio, has announced the development of a new tread rubber compound which promises increases of more than 50 per cent in truck tire mileages. According to the company, the improvement in retreading tires is the result of research conducted by Mohawk in conjunction with the jet aircraft industry. The objective of the effort was to develop improved retreading methods and materials for tires used to land the giant jet aircraft. From its exploration in the high heats and shock loads encountered, its engineers discovered a retreading process which they recognized had immediate advantages to truck tire retreading, the company reports. The new process, called Mo-Mile, was tested on truck fleets operating over regularly scheduled runs. Mohawk claims that the new tread compound can be applied with the retreader's present equipment and requires no special handling or process changes.

New Northwestern Board

► John Riddell and L. V. D. Tindale have been elected directors of The Northwestern Rubber Co., Ltd., Liverpool, England. The reconstitution of the board followed a change in ownership of the majority of the company's shares. At the same time it was announced that Wilfrid Murray has been named managing director of the firm. He succeeds A. Nourry who had retired after 52 years of association with the company. Mr. Nourry will be retained by the firm as a consultant.

Goodrich HT Silvertown Tire

► B. F. Goodrich Co., Akron, Ohio, has introduced a new premium passenger tire that is expected to provide a 22 per cent increase in mileage over tires that come as standard equipment on new cars. According to Goodrich, the new tire, called HT Silvertown, will be priced at 10 per cent above standard equipment tires, but 25 to 50 per cent below other premium tires. A company spokesman states that usually, premium tires are built to stress one outstanding feature such as extra mileage, or blowout protection, or easy riding, or high-speed safety, or extra strength, or quiet running. The new tire, according to the company, has all of these features as a result of new wider and deeper tread design, nylon cords, wider tread "ribs" and a newly developed rubber compound which results in a soft-riding, quiet running tread yet does not sacrifice wear. The HT Silvertown will be placed on sale in Houston, Texas and throughout the Southwest in October with national distribution following later in the year.

Firestone Tests Dacron Cord

► Firestone Tire & Rubber Co., Akron, Ohio, has completed part of a research program which is said to indicate that Dacron synthetic fiber might do as well in tires as it has done in broadcloth. Dacron and a number of other polyester fibers, including Terylene, have undergone tests in which the fibers were used as cords in tires covering more than a million test miles. The research program was centered on a wide range of fibers, including acrylics, all of which were eliminated in preliminary tests with the exception of the polyesters, Firestone said. The company now plans to equip fleets in various parts of the nation with Dacron and Terylene tires and will then compare the results with earlier findings for further evaluation. No plans are presently under way to put the Dacron and Terylene cord into commercial production.

Sells Interest in Two Firms

► United Carbon Co., New York, N. Y., has sold its minority interests in the Odessa Butadiene Co. and the Odessa Styrene Co. to the El Paso Natural Gas Products Co., Odessa, Texas, the operator and majority holder in both firms. Terms of the acquisition were not revealed. Through this acquisition, El Paso attains 100 per cent ownership of the styrene company, which has an annual capacity of 45,000,000 pounds, and 75 per cent ownership of the butadiene company, which produces 115,000,000 pounds annually. El Paso will continue to supply principal requirements of butadiene and styrene to United's rubber and chemical interests under the same general terms of the original sales contract between the two companies.

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97	"	for nitrile, nonblack
254	"	for neoprene, black
116	"	for neoprene, nonblack
101	"	for butyl, black
57	"	for butyl, nonblack
50	"	for polysulfide, black and nonblack
36	"	for reclaim (all black compounds)
45	"	for Hypalon, black and nonblack
86	"	for silicones, black and nonblack
92	"	for vinyls (all black compounds)
100	"	for miscellaneous other rubbers, black and nonblack
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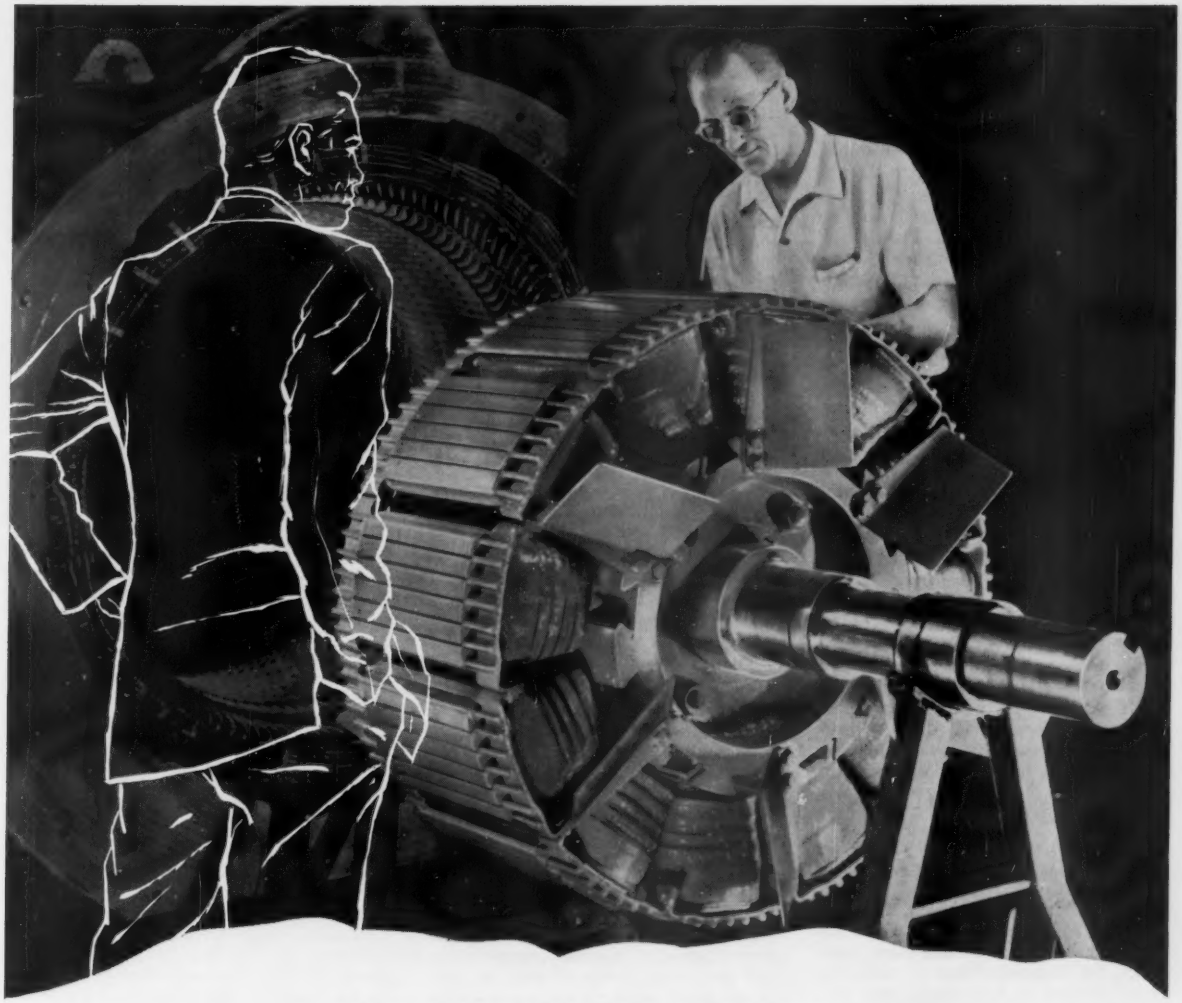

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Philadelphia Elects Officers; Hears McFadden on Imports

► Cornelius P. McFadden, assistant secretary of the Rubber Manufacturers Association, spoke on "Export-Import Problems of Rubber Products," at the fall meeting of the Philadelphia Rubber Group on October 2 at the Poor Richard Club, Philadelphia, Penna. Over 120 members attended the meeting at which officers were elected for the coming year.

Following the address, these officers were elected for the 1960 term: *Chairman,* Henry C. Remsberg (Carlisle); *Vice-Chairman,* Richard N. Hendriksen (Phillips), and *Secretary-Treasurer,* Richard M. Kerr (H. K. Porter). Chosen to serve as *Directors* were: Bernard Van Arkel (Walker Brothers), Kenneth E. Chester (C. P. Hall), and William Macomber (U. S. Rubber).

Mr. McFadden discussed the problems which confront the rubber manufacturer because of increased imports and the proposed lowering of tariffs under recent international agreements. He said that manufacturers of rubber footwear were in particular danger from competition with foreign producers whose lower wage scales enabled them to undersell American products. He also cited reports on sundries and mechanical rubber goods which showed a marked increase in the imports of these products during the past nine years.

After tracing the history of tariffs, Mr. McFadden discussed the sentiment in favor of free trade that had prevailed after World War II. He said that most of the recent tariff concessions had been concluded under the General Agreement on Tariffs and Trade (GATT). He surmised, however, that government officials are becoming aware of the adverse effects liberal trade policies can have on U. S. payrolls and buying power.

The Philadelphia Group claims to be the first Rubber Group in the country to have its own band, complete with Group marching song. The members of this ensemble, which made its debut at the August 21 outing, include: Aaron Back (consultant), Ralph Graff (Du Pont), Thomas Elkin (Vanderbilt), Warren Carter (American Hard Rubber), A. H. Johnson (Armstrong Cork), Robert Sinnamon (H. K. Porter), George Winspear (Vanderbilt), Henry Remsberg and Richard Hendriksen.

The next event is scheduled to be the Annual Dance, to be held November 6 at the Manufacturers Country Club in Philadelphia. Dress will be informal and the Group will provide corsages for members' wives.

Smith Discusses Butyl Rubber At Chicago Group Meeting

► The Chicago Rubber Group held a technical meeting on September 18 at the Furniture Club in Chicago, Ill., with 160 members in attendance. The technical session featured a talk on "New Concepts in Butyl" by W. C. Smith (Enjay) and a film called "Butyl Rubber from Oil" which was obtained from the Bureau of Mines.

Mr. Smith discussed the latest advances in butyl technology including new polymers, curing systems and processing methods. The major portion of his talk was devoted to the recent work done with new cure combinations and materials. The cure systems mentioned by Mr. Smith included the sulfur donor system; low sulfur and high acceleration vulcanizate system; resin cure; zinc oxide cure; diamine cure; and quinoid cure. Mr. Smith discussed in detail the sulfur and resin cures, and mentioned the merits and demerits associated with the other systems.

The 1959-1960 officers of the Chicago Rubber Group were appointed and introduced at the meeting. They are: *President,* John Groot (Dryden Rubber); *Vice-President,* Stanley Choate (Tumpeer Chemical); *Secretary,* Theodore Argue (Roth Rubber); and *Treasurer,* Russell Kirtz (DuPont).

On July 24, 375 members attended the annual summer outing of the Chicago Rubber Group. The outing was held at the St. Andrews Country Club. The outing committee consisted of: *Chairman,* Harold Shetler (Chicago Rawhide Mfg.); *Assistant Chairman,* Harold Stark (Dryden Rubber); *Committee Members,* Bill Cary (Cary Co.); Paul Chalex (Richardson Co.); Al Cobbe (Godfrey L. Cabot); Hy Crosland (Chicago Rawhide Mfg.); John Hunter (Goodyear Chemical); Bateman Hutchison (Copolymer Rubber & Chemical); Bill Lussie (R. T. Vanderbilt); John Porter (H. Muehlstein); Ralph Schell (Bauer & Black); Frank Smith (William-Bowman Rubber); Russ Spielman (Witco Chemical); Ed Wagner (Witco Chemical); and Yale Karmell (Sam'l Bingham's Son Mfg.).

Caldwell Now Called Americhem

► The Caldwell Co., Akron, Ohio, in business 16 years as a manufacturer's representative and development company, has announced that its name has been changed to Americhem, Inc. The company represents such firms as Synthetic Products Co.; Greensboro Sales Division of Chas. Pfizer & Co.; Diamond Mica Co.; Thompson-Weinman & Co.; Resyn Corp.; and B. F. Drakenfeld Co. The company handles chemicals for the rubber, plastics and paint industries. The firm has developed a line of color dispersions and an adhesive which is used for applying rubber and vinyl tile on and below grade. The company also has announced that its new headquarters will be located at 1651 Home Avenue, Akron, Ohio. The additional space acquired will provide for expansion of sales offices, and will allow room for sales service laboratory facilities, the company states.

Dayton Speed-E-Cure Thoro-Tred

► Tire Division of the Dayton Rubber Co., Dayton, Ohio, is marketing what is said to be a new fast curing, long-wearing tread rubber to retreading plants throughout the nation. Known as Speed-E-Cure Thoro-Tred, the new compound has a shelf life which is comparable to that of conventional tread rubber. According to Dayton, the product cures completely in 36 minutes against 55 minutes for an average passenger car tire; works easier; fills matrices evenly; and retains tack and bonds perfectly. Special compounding and processing is said to give the new tread rubber excellent wearing qualities for thousands of extra miles. Speed-E-Cure tread rubber is available in the complete range of sizes for passenger car and truck tires.

Grace Plans Two Acquisitions

► The board of directors of W. R. Grace & Co. has approved in principle the acquisition of the assets of Endura Corp., Quakertown, Penna., and the stock of the Vellumoid Co., Worcester, Mass. Terms of the acquisitions, which are subject to final audit and court license, were not disclosed. The new acquisitions will be made on behalf of Grace's Dewy and Almy Chemical Division and their product lines will augment that division's existing line of impregnated products. Endura manufactures pressure-sensitive tape backings and latex-impregnated tape backings, shoe stay material, coating base for specialty clay-coated printing papers, artificial leather coating bases and impregnated papers for high-pressure laminates. Vellumoid is said to be the world's leading manufacturer of non-metallic gaskets, which include impregnated fiber gaskets and packing and latex impregnated materials.

Develops Stabilizer for Latex

► Commonwealth Engineering Co. of Ohio, Springfield, Ohio, has announced the development of a stabilizer for latex. According to the company, the new material, covered by U. S. Patent No. 2,856,372, protects rubber and latex against deterioration over extended periods, and only very small amounts need be used, for example, 5 parts in 200. Commonwealth claims that the new stabilizer does not interfere in any way with subsequent handling, processing or molding operations. The product is available on a licensing basis, the company states.

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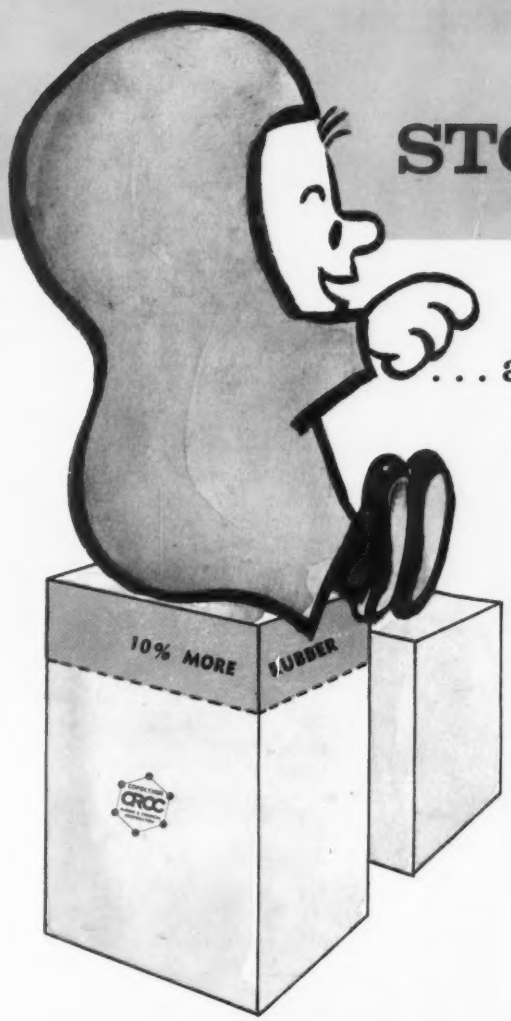

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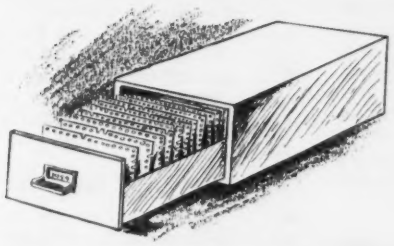

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Low Profile Tire

► U. S. Rubber Co., New York, N. Y. has announced the development of a 13 inch low profile tire, radically new in design and engineered specifically for the compact cars which will be introduced by American automotive manufacturers this Fall. According to U. S. Rubber, the new tire is the result of an intensive two year research and engineering program conducted by its scientists working in close cooperation with automotive engineers of the Chevrolet Division of General Motors Corp. The tire, now in production at company tire plants, will be original equipment on Chevrolet's new Corvair. The new tire has a low profile shape which differs from the conventional in that it is oval in cross section—wider than it is high. This shape, the company reports, coupled with new and improved longer cords built into the tire at an unusual cord angle, gives it tremendous stability and cornering power. Mounted on wide rims, it is particularly suited for a rear engine car where its stability contributes to the car's superior riding and steering performance, the company states.

The carcass of the new tire is constructed of Tyrex cord and its tread pattern has seven rows which are heavily slotted for extra skid resistance and traction. The new tire will carry the trade name U. S. Royal Low Profile Safety 8, and will be produced in sizes to meet the requirements of all new compact cars produced by American manufacturers.

Retires from Manhattan Rubber

► William L. White, technical consultant, has retired after 42 years with the Manhattan Rubber Division of Raybestos-Manhattan, Inc., Passaic, N. J. He was director of research and product design until 1957 when, at his request, his activities were reduced and he assumed the title of technical consultant, devoting his time to the handling of special projects. Mr. White joined Manhattan in 1917 as a chemist in charge of reclaiming rubber. He was in production work during the 1920's and was placed in charge of laboratory work in 1931. After serving as assistant factory manager in 1942, he returned to laboratory work as director of research and product design in 1943.

Mr. White is a graduate of Penn State with a B. S. in chemistry. His first post was with the U. S. Rubber Co., first at its newly organized central laboratory in New York City and then with its reclaiming plant at Naugatuck, Conn. During World War II, he served on several rubber industry committees covering raw materials. In 1945, he served on the Technical Industrial Intelligence Commission with rank of Colonel. Mr. White was tendered a testimonial dinner recently.

Ernest L. McClure, Jr.

Named Sales Engineer

► Goodrich-Gulf Chemicals, Inc., Cleveland, Ohio, has announced that Ernest L. McClure, Jr., has been promoted to sales engineer. Mr. McClure will cover the southern and southwestern area and will be headquartered in Memphis, Tenn. Mr. McClure received a B.S. degree in chemical engineering in 1957 from the University of West Virginia. He joined Goodrich-Gulf following graduation and was assigned to the firm's sales service laboratory at its Institute, West Va., plant. In 1958 he was transferred to the company's sales office in Cleveland for further training.

Brill Named Vice-President

► International Latex Corp., Dover, Del., has announced the appointment of Curt K. Brill to the new post of vice-president of international market development. Mr. Brill joined International Latex in 1952. In January of this year he was named general manager of international marketing and development, a post he held until his present appointment.

Menkes Named Vice-President

► George Menkes, formerly sales manager, has been elected vice-president of Testing Machines Inc., Mineola, L. I., N. Y. Mr. Menkes graduated from Fairleigh Dickenson College and before joining the firm, was with the United Motor Division of General Motors. He is a member of technical committees of ASTM and TAPPI.

Tamms Appoints Herr Co.

► L. H. Herr Co., Denver, Colo., will represent Tamms Industries Co., Chicago, Ill., in Colorado and portions of Wyoming and New Mexico. Tamms produces a complete line of filler and extender pigments for use by rubber, paint, polish, putty and compound manufacturers.

Brooks Retires from U. S. Rubber

► Dr. Arthur E. Brooks has retired as assistant director of research and development for the U. S. Rubber Co., New York, N. Y., after 30 years of service. In tribute to his service, Dr. Brooks was honored at a retirement dinner, on October 29, by 125 associates from the company's Research Center and at a luncheon, on October 28, given by the Research Center 25-Year Club. Dr. Brooks' early experience with the company included 12 years as a research chemist at the firm's General Laboratories; three years during World War II as technical director of the Des Moines ordnance works; and three years as department head for organic research at the General Laboratories.

In 1947, Dr. Brooks was promoted to assistant to the company's director of research and in 1950, to manager of the General Laboratories. When U. S. Rubber opened its new Research Center at Wayne, N. J., in 1957, Dr. Brooks continued as manager of installation and in 1958, was promoted to assistant director of research and development. Dr. Brooks was graduated from Johns Hopkins University in 1915 and received his M. S. and Ph. D. degrees from the University of Chicago. While studying for his doctor's degree, he was head of the Science Department at the Hinsdale, Ill., high school.

New DuPont Methylamine Plant

► E. I. du Pont de Nemours and Co., Inc., Wilmington, Del., will build a new plant for the production of methylamines, basic chemicals used in the manufacture of rubber chemicals, rocket propellants, textile fibers and dyes. The new plant, to be constructed at Belle, West Va., will more than double DuPont's capacity for methylamines now being made at the Houston, Texas, works.

Belle is considered a logical choice for the new plant site since it already produces the necessary raw materials, ammonia and methanol. In addition to dimethylamine (DMA), the plant will produce methylamine derivatives such as dimethylformamide (DMF) and dimethylacetamide (DMAC). DMF is used principally in the manufacture of acrylic fiber and as a solvent for vinyl resins in lacquers, films and printing inks. DMAC is a new polar solvent, now available in commercial quantities, which is expected to find use as a polymer and crystallization solvent and as a chemical reaction catalyst and medium.

► The typical properties of its complete line of "Attapulgas Clay" products are presented in Technical Information No. 1002, a four-page, two-color bulletin published by Minerals & Chemicals Corp. of America.

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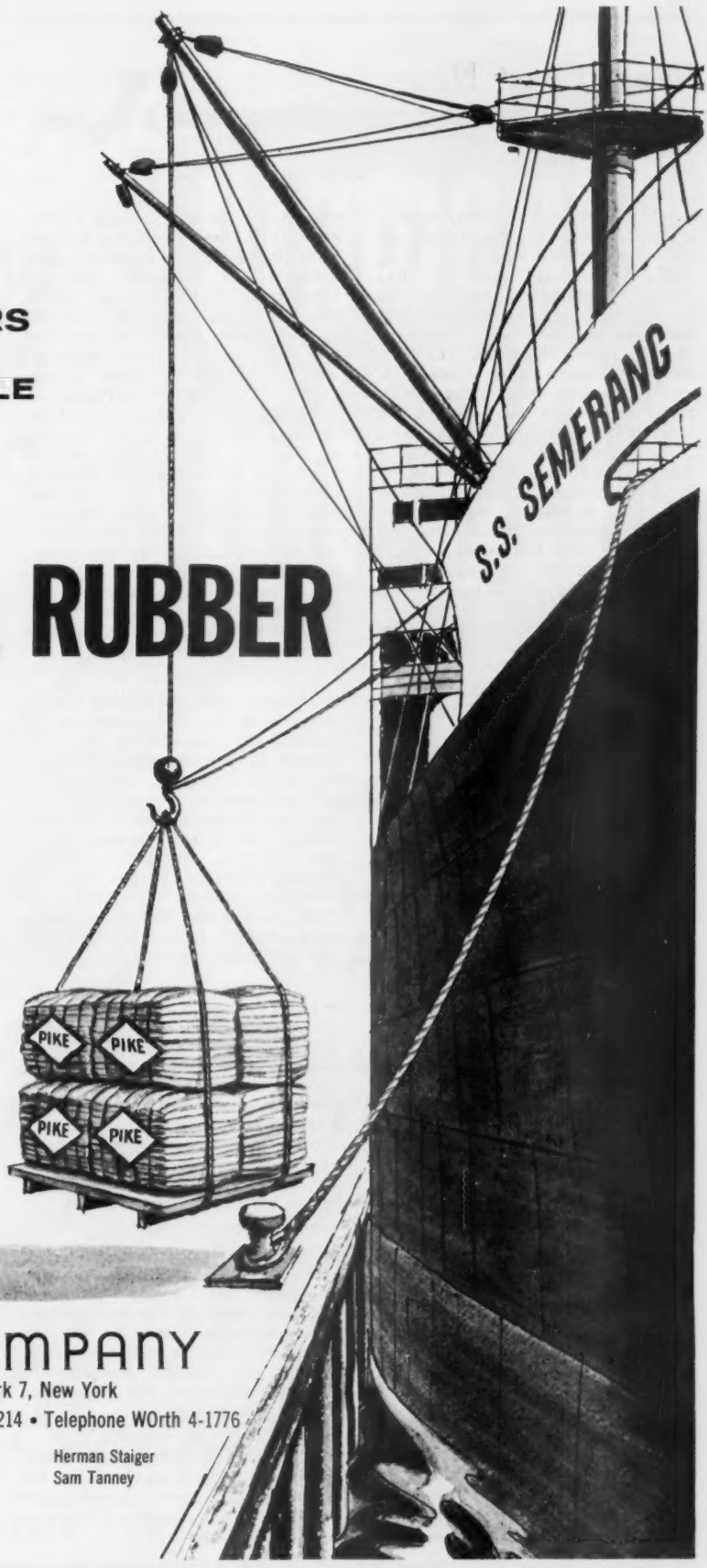

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West Coast News

► John Augenstein, a 25-year veteran in rubber chemistry, has joined the staff of the Kirkhill Rubber Co., Brea, Calif., as technical director. Mr. Augenstein will supervise the work of the Kirkhill testing and research laboratory and will guide the development of new rubber materials. He is a chemistry graduate of Mississippi College and before entering the rubber chemistry field, he was a member of the technical staff of Bell Laboratories.

The company has also announced that Donald E. Cornmesser, a veteran in rubber management and production, has joined its staff as superintendent of the Molded Products Section. Mr. Cornmesser, who has served as plant manager of rubber companies in the East since World War II, is a graduate of Ohio Northern University and commanded an Ordance field unit during the war.

► The November 3 dinner meeting of the Los Angeles Rubber Group, Inc., sponsored by the Firestone Tire & Rubber Co., presented Sam Hanks, winner of the 1957 Indianapolis race, as guest speaker. Mr. Hanks conducted a question and answer forum following the screening of Firestone's latest race film, "Circle of Confidence." At the technical meeting preceding the dinner, Donald M. Alstadt (Lord Mfg.) discussed "Theoretical and Practical Aspects of Rubber-Metal Bonding."

According to Mr. Alstadt, major factors influencing adhesive bonding of an unvulcanized elastomer to metal are divided into three groups including factors involving the character of the elastomer to be bonded; those involving the adhesive polymer nature; and factors involving the structure of the metal. For adhesion at polymer-polymer interfaces, conditions favoring the formation of primary valence bonds, interfacial wetting and interfacial diffusion must be promoted.

Chemical and physical characteristics of both adhesive and elastomer systems must be controlled to produce such effects, the speaker said. Atomic structure of the base metal, character of surface films and the metallurgical state of the metal substrate all affect the adhesive-metal interface union. Miscellaneous rheological electrochemical and mechical factors also affect the strength and environmental resistance of the adhesive bond. In conclusion, Mr. Alstadt stated that certain fundamental principles underlying the operation of any adhesive system are also valid for the adhesion of rubber to metal.

At the group's October 6 meeting, door and raffle drawing prizes, contributed by the Plastics and Rubber Products Co., were awarded as follows: Wrist Watch: Zillie Palumbo (Ohio Rubber), Bob Stringfield (Fullerton Mfg), and Mel Anderson (Gross Mfg.); Cuff Links and Tie Tack: Al Myland (guest, Regency Rubber) and Harry Trechter (Harwick Standard); and Wallet: Ted R. Walter (Union Carbide), and Guy Nolan (Thiokol).

Tlargi has also announced that the annual Christmas party will be held on December 11 from 6:30 p.m. to 1 a.m., at the International Ballroom of the Beverly Hilton Hotel. The evening will include cocktails, dinner, a floor show and dancing. Party favors will be presented to every lady present and other prizes will be awarded as well. Doc Chaffee is chairman of the *Christmas Party Committee;* Chick Hart of the *Prize Committee;* and Dick Wells of *Table Reservations.*

► Marbon Chemical Division of the Borg-Warner Corp. has announced the addition of Colorado to the states covered by Harwick Standard Chemical Co. of California, distributor for Marbon products. Harwick Standard has been Marbon's West Coast representative for the last nine years, covering California, Washington, Oregon, Nevada, Utah and Arizona. The firm distributes Marbon 9200 and 1100 TMV paint resins, 8000 series rubber resins, Marmix Latices, Ty-Ply adhesives and Cycolac ABS resins.

► Coast Pro-Seal & Manufacturing Co., Los Angeles, Calif., has completed construction on its $500,000 Chemical Division facility for the production of sealants, coatings and adhesives for aircraft, electronic, building, automotive and marine requirements. The new 42,000 square foot plant, to be located at Compton, Calif., will incorporate the latest structrual appointments and design features.

► National Polymer Products, Inc., a subsidiary of the Polymer Corp. has announced that Douglas L. Cochran has been appointed vice-president. He will be in charge of sales for National, which specializes in plastic resins for coating and injection molding. Mr. Cochran was formerly with Wicoa, Inc., of Santa Barbara, Calif.

► Jim Morrsion, formerly chief chemist at the Kirkhill Rubber Co., has been appointed special representative for the Goodyear Chemical Division in Los Angeles.

Samuel J. Rosch

Retires from Anaconda Wire

► Samuel J. Rosch, consulting cable engineer for the Anaconda Wire and Cable Co., New York, N. Y., has announced his retirement from that firm, effective December 1. Mr. Rosch, who was born in Austria, attended the City College of New York, receiving his B.S. degree in 1910. After graduation, he joined the Safety Insulated Wire and Cable Co. Later, he served with the National Conduit and Cable Co., which became the American Brass Co. in 1923 and was acquired by Anaconda Wire in 1929. Mr. Rosch has served as cable engineer, manager of insulated products and development, and as consulting cable engineer. He is a member of the A. I. E. E.; I. A. E. I.; the New York Rubber Group; I. P. C. E. A.; A. S. T. M.; F. & A. M.; I. M. S. A.; Professional Engineers of New York; the American Society of Naval Engineers; Armed Forces Communication Association; American Ordnance Association; and the Conference on Electrical Insulation N. R. C.

Rubberized Roads in Australia

► The Natural Rubber Development Board, London, England, has published a report called "Rubber in Roads, Bulletin No. 13," which describes a recent series of layings of rubberized bitumen in various towns in Queensland, Australia. The bulletin states that each of the towns had its own particular problem, but in general what was required was a flexible tenacious binder which would maintain a seal over surfaces subjected to some degree of movement and where cracking was already apparent. According to the board, the decision to try out rubberized bitumen in Queensland was influenced by the good reports on the performance of rubberized surfacings laid previously in Tasmania, Victoria, South Australia and Western Australia. A copy of the bulletin is available from The Natural Rubber Development Board, Market Building, Mark Lane, London, E. C. 3, England.

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Canadian News

► Dr. Taylor Evans has been appointed manager of market research for the Naugatuck Chemicals Division of the Dominion Rubber Co., Ltd. Dr. Evans will be responsible for market research studies for new organic chemicals in Naugatuck's expansion program, as well as market studies for rubber chemicals, agricultural chemicals, plastic resins, and organic intermediates presently in production. He will make his headquarters at Naugatuck's offices in Elmira, Ont.

Dr. Evans received his B. Sc. and M. Sc. degrees in chemistry from the University of Alberta and his Ph. D in chemistry from McGill University. He is a Fellow of the Chemical Institute of Canada. Prior to joining Dominion Rubber in 1943 as a research chemist at the General Laboratories in Guelph, Dr. Evans was a sessional lecturer in industrial and cellulose chemistry at the McGill University School of Graduate Studies. He is the author of a number of scientific papers and has also received patents relating to the manufacture of sulphamerazine and thiamine hydrobromide.

According to current reports, Dominion Rubber recently suspended 900 employees for three days after a work stoppage which was begun by 50 workers in the Tire Department. The stoppage spread to other departments and 900 were suspended, with only 250 remaining at work. Tire workers objected to the recent installation of a new machine for producing automobile tires. They said a revised production schedule constituted a speed-up.

Factory manager, W. A. Martin, said workers had been warned that a work stoppage was contrary to the company's contract with Local 80, United Rubber Workers of America. James A. Devitt, president of the local, said the union believes "the speed-up the company instituted is unreasonable." He recommended that the men return to work when the suspension ends "to give the union an opportunity to settle the dispute through reglar grievance channels."

► Canadian Industries, Ltd., has announced the discovery of a new system of bonding polyester fiber to rubber, a development which is expected to have world wide implications in the manufacture of tires, industrial V-belts, automotive fan belts, conveyor belting and other mechanical goods. A spokesman for the firm said that this research achievement means that Terylene may now be used as readily as other fibers in the mechanical rubber goods field. The system is said to offer promise in the use of Terylene cords in tires.

The firm has also announced that tires made with Terylene cord will be competitive with nylon tires, provided present exhaustive tests being made by the Firestone Tire and Rubber Co., in the United States prove to be satisfactory. Terylene is chemically identical with the United States polyester product, Dacron, which is also being tested by Firestone. The Firestone tests are to be continued through the next few months.

► Pangborn Canada, Ltd., has been incorporated to market the complete line of blast cleaning and dust control equipment and metal abrasives produced by Pangborn Corp., Hagerstown, Md. With offices at 38 Mattson Road, Toronto, Pangborn is equipped to better serve the growing list of Canadian customers in the blast cleaning and dust control fields. The board of directors of the new company include: Thomas W. Pangborn, *Chairman;* John C. Pangborn, Ralph M. Trent, Lloyd L. Stouffer and Helen R. Fisher. Officers are Ralph M. Trent, *President;* Lloyd L. Stouffer, *Vice-President;* Helen R Fisher, *Secretary;* and John R. Bell, *Treasurer.*

► The Toronto plant of the Dayton Rubber Co. may be "doubled or even tripled in the near future," according to Clowes M. Christie, president of the firm. Mr. Christie spoke at a dinner honoring long service employees at which 11 persons with a combined job record of 165 years received service pins. Two also received watches.

► The United Kingdom Board of Trade has launched a program to dispose of approximately 100,000 tons of stockpiled rubber on a graduated scale, with monthly releases depending on price. Some sources believe that high-flying quotations for natural rubber may swing back as a start is made on disposal of stockpile supplies.

McCardle Joins Dewey and Almy

► Billy E. McCardle has joined the Dewey and Almy Chemical Division, W. R. Grace & Co., Cambridge, Mass., as a sales representative for organic chemicals. Mr. McCardle will cover the territory of North Carolina, South Carolina and Southern Virginia. Mr. McCardle received a B.S. degree in chemistry from the University of Alabama in 1951. He formerly was with the Southern Sash Sales and Supply Co., the Flagg Utica Corp. and Avondale Mills.

Samuel B. Coco, Jr.

Named Administrative Assistant

► Godfrey L. Cabot, Inc., Boston, Mass., has announced the appointment of Samuel B. Coco, Jr., as administrative assistant to Owen J. Brown, Jr., vice-president and director of sales for Cabot. Mr. Coco previously was with the Cabot sales office in Akron, Ohio, where he served since 1956 as carbon black sales representative and special technical consultant on matters pertaining to bulk handling and packaging services. Mr. Coco graduated from Louisiana State University in 1950, with a B.S. degree in mechanical engineering and joined the engineering staff of Cabot Carbon Co., a Godfrey L. Cabot subsidiary which is headquarters for Southwestern operations. In 1952 he was appointed administrative assistant to the general superintendent of carbon black production. Mr. Coco was the first chairman of Carbon Black Packaging, Inc., an industry-wide organization formed to study and improve methods for the packaging of carbon black. He is a member of the University Club of Akron, the Akron Rubber Group, the Ft. Wayne Rubber & Plastics Group, and the Southern Rubber Group.

Dedicates New Laboratories

► U. S. Stoneware Co., Tallmadge, Ohio, has dedicated its newest facility, the Chamberlain Laboratories, a $1,000,000 research and development plant. Employing a staff of 30, the laboratory will be headquarters for the company's product development and product diversification program. Included on the staff are 10 technicians and 20 research chemists, engineers and draftsmen. Don F. Siddall is plant director of research. Working principally in the fields of plastics, rubber, adhesives and protective coatings, the plant also aims at improving manufacturing techniques, standards, quality control and customer assistance. Approximately $250,000 was invested in the building and an additional $750,000 in equipment. The new laboratory is located in Stow, Ohio.

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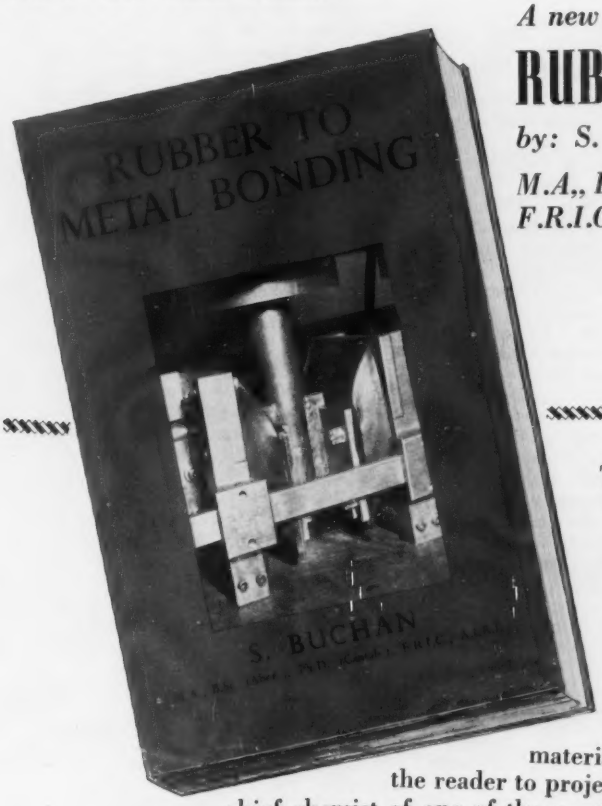

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Obituaries

Luther B. Martin

► Luther B. Martin, retired technical director of tire production for the U. S. Rubber Co., died on October 19 at the Jennings Memorial Hospital in Detroit, Mich. He was 74 years old. A native of Allendale, S. C., and a graduate of the National Law School, Washington, D. C., Mr. Martin joined the rubber firm in 1918 as a chemist in the Hartford Rubber Works, Hartford, Conn. He was subsequently made laboratory superintendent at the Providence Rubber Co. and in 1923, was appointed assistant factory superintendent of the Hartford Rubber Works. He was named factory manager there in 1929 and in 1930, was transferred to the company's Detroit, Mich., plant.

Three years later, Mr. Martin was appointed manager of tire quality and in 1944, was made assistant director of tire development for the company's Tire Division, which involved five tire and tube plants located at Detroit; Eau Claire, Wisc.; Chicopee Falls, Mass.; Los Angeles, Calif.; and Indianapolis, Ind. In March 1945, he was appointed director of tire development with headquarters at Detroit, holding that position until he was named to the post of technical director of tire production. Mr. Martin retired on November 1, 1948, after 30 years of continuous service to the company.

During World War II, Mr. Martin was chairman of the Ordnance Advisory Committee of the Tire and Rim Association, a member of the War Production Board Tire and Tube Technical Consulting Committee, and a member of the Synthetic Test Committee of the Tire Industry. His services during the war were recognized by the government with the Award of Merit for his work on synthetic rubber tires. He is survived by his wife, a son and two daughters.

Sid W. Richardson

► Sid W. Richardson, founder of the Sid Richardson Carbon Co., died on September 29 on St. Joseph's Island in the Gulf of Mexico. Mr. Richardson, who had gained fame as a Texas oil producer and as one of the wealthiest men in the world, was born in Athens in East Texas. For a time, he attended Baylor University and Simmons College in Texas and then went to work in the oil fields. During his lifetime, Mr. Richardson made and lost several fortunes. Two years ago, his wealth was estimated at more than $200,000,000 and in addition, he had an estimated total of $500,000,000 worth of oil in underground reserves.

George H. Halpin

► George H. Halpin, vice-chairman of the executive committee of the Minnesota Mining and Manufacturing Co., died on October 20. He was 69 years old. Born in Rock Island, Ill., Mr. Halpin attended St. Louis University and began working in St. Louis at the American Glue Co. For two years, he served in the Air Service in World War I, leaving with the rank of captain. He returned to civilian life as a sales manager of American Glue and two years later joined Baeder Adamson & Co. as vice-president, sales manager and director.

When Baeder Adamson was acquired by Minnesota Mining in 1930, Mr. Halpin became sales manager of the parent company. Eight years later, he was named vice-president and general sales manager, and was elected to the board of directors in 1939. In 1949, Mr. Halpin became executive vice-president in charge of sales; in 1955, executive vice-president; and executive committee vice-chairman in 1956. He was past president of both the American Supply and Machinery Manufacturers Association and the American Hardware Manufacturers Association.

J. O'C. Brown

► J. O'C. Brown, vice-president of Petro-Tex Chemical Corp. and a veteran of over 43 years in the petroleum and rubber industries, died in Houston, Texas, on October 2 after a prolonged illness. He was 62 years old. Mr. Brown joined Sinclair Refining Co. in 1916 at its Mereaux, La., refinery and advanced through various operating levels to become superintendent of the Lube Oils Division of the Sinclair Refinery at Houston in 1923. In July 1942, at the outset of the GR-S program, he was chosen general superintendent of Sinclair Rubber, Inc., which was created to operate the government-owned butadiene plant at Houston. Mr. Brown was named manager in 1950 and continued in that capacity after the acquisition of the Sinclair butadiene facility from the government by Petro-Tex. He was elected a vice-president of the firm in 1956.

Charles H. Thwaites

► Charles H. Thwaites, control manager for the Plantation Division of the U. S. Rubber Co., died of a heart ailment on October 23 in the Closter Medical Center. He was 57 years old. Mr. Thwaites was a member of the Certified Public Accountants of New York and New Jersey. Surviving are his wife and three daughters.

Donald M. Nelson

► Donald M. Nelson, chairman of the War Production Board during World War II, died on September 29 at Good Samaritan Hospital in Los Angeles, Calif. He was 70 years old. As chairman of the War Production Board, Mr. Nelson applied the knowledge of American industrial processes and principles of mass buying he had acquired in 29 years with Sears, Roebuck & Co. to the nation's production program. Mr. Nelson was born in Hannibal, Mo., and worked his way through the University of Missouri, receiving a B.S. degree in 1911. In order to earn funds to get a doctorate in chemistry and teach, he joined the testing laboratory of Sears, Roebuck.

Remaining with the firm, Mr. Nelson served in several capacities and in 1939, was named executive vice-president and chairman of the concern's executive committee. Five weeks after the Japanese attack on Pearl Harbor, President Roosevelt replaced the Office of Price Maintenance with the War Production Board, naming Mr. Nelson chairman and endowing him with full and final authority over the entire production program. His book, "Arsenal of Democracy", covers his experiences during this period. Mr. Nelson was named special representative to Chiang-Kai-shek in 1944 and in 1945, he returned to private business.

Kenneth B. Bolton

► Kenneth B. Bolton, a sales representative for the Titanium Pigment Corp., died at Cleveland, Ohio, on September 12. Mr. Bolton was born at Troy, N. Y., and educated at Phillips Andover Academy and Yale University. He joined Titanium Pigment in 1936 and spent the earlier part of his career with the firm serving in the New England and Chicago territories. In 1950, he went to Cleveland as a sales representative. Mr. Bolton was associated with Certain-Teed Products Corp. before joining Titanium Pigment. He served as a lieutenant in the United States Navy during World War II. He is survived by his wife.

Louis Waldbauer

► Dr. Louis J. Waldbauer, supervisor of the Analytical Research and Technical Information Section at the General Aniline and Film plant in Rensselaer, N. Y., died on October 20. He was 63 years old. Before joining General Aniline, Dr. Waldbauer had been a research chemist with E. I. du Pont de Nemours & Co., Inc. He had taught at the University of Maine, McGill University, Lehigh University and the State University of Iowa. Dr. Waldbauer was a frequent contributor to scientific journals and was the author of a book on analytical chemistry. He is survived by his wife and a daughter.

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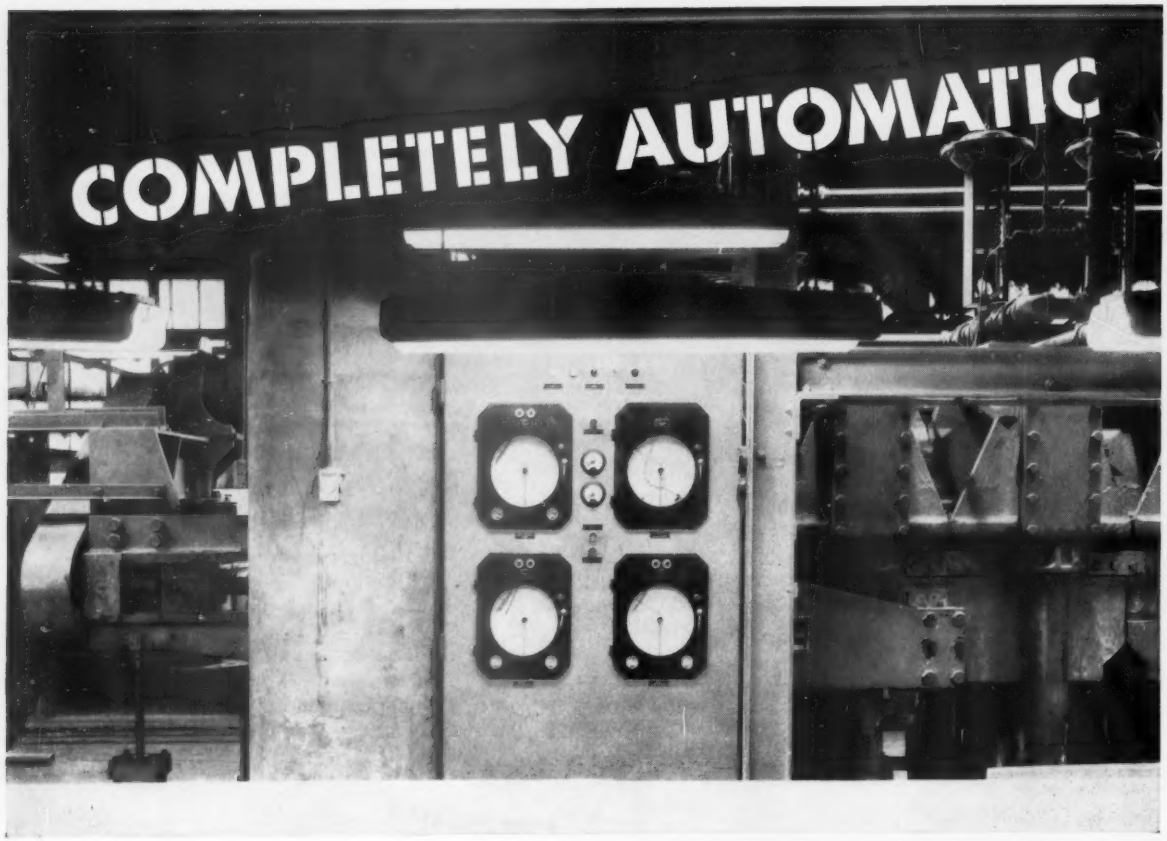

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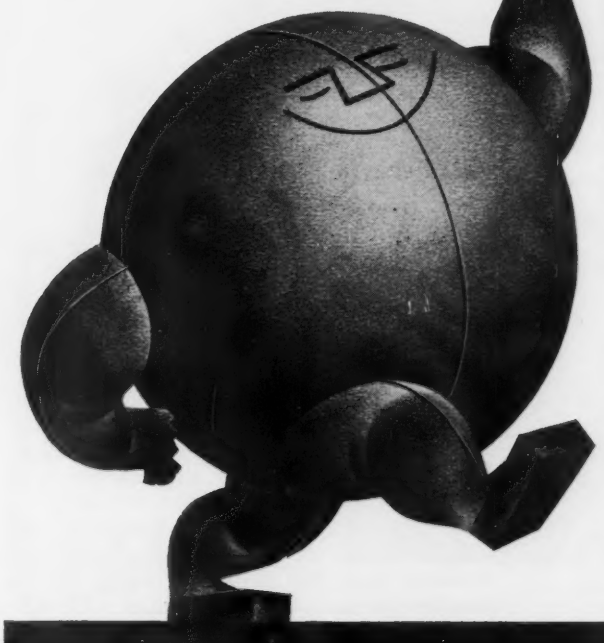
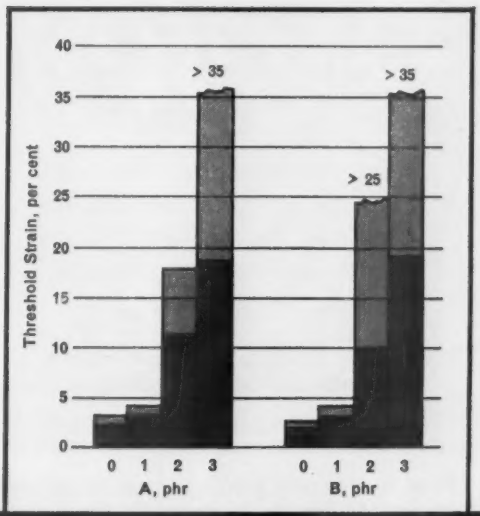
UOP 88® ANTIOZONANT

UOP 288® ANTIOZONANT





severe conditions of ozone and stress call for extra-special protection . . .

Smog which may contain up to 100 pphm ozone is hard on health and disposition. It is equally hard on rubber products. High ozone levels cause severe cracking in rubber formulations. In addition, stress also contributes to this problem as shown in chart. How do you prevent such deterioration, assure long service life for your product under severest service conditions?

First, use antiozonants UOP 88 or 288, which offer maximum ozone protection. A relatively small loading of these low-cost antiozonants goes a long way in providing increased protection.

Ozone concentration is but one of many factors to consider in manufacturing antiozonant-containing rubber products. Our staff of specialists, backed by UOP laboratory facilities and field experience, will be happy to discuss your problems with you. Simply write or telephone our Products Department.

40 pphm ozone

120 pphm ozone

Chart above shows effects of increasing antiozonant content of SBR stocks to meet increasing ozone level.

UOP®

UNIVERSAL OIL PRODUCTS COMPANY

30 Algonquin Road,
Des Plaines, Illinois, U.S.A.

The only explanation I have is that he must be in the neoprene business— and knows that MAGLITE is the key to superior scorch protection.

Maglite®

The performance-proved magnesium oxide

Want to eliminate scorch damage in neoprene processing? Specify MAGLITE D. Tests prove that it offers better scorch protection for neoprene than any other magnesium oxide you can use. MAGLITE D also helps solve storage problems since it occupies about one-third the warehouse space as many of the lightweight magnesias. The benefits of using MAGLITE K, M, or Y for other elastomers and certain product or process requirements are equally impressive. For samples and technical information write to MERCK & CO., INC., Marine Magnesium Division, Department RA-6, Rahway, New Jersey.

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New Goods

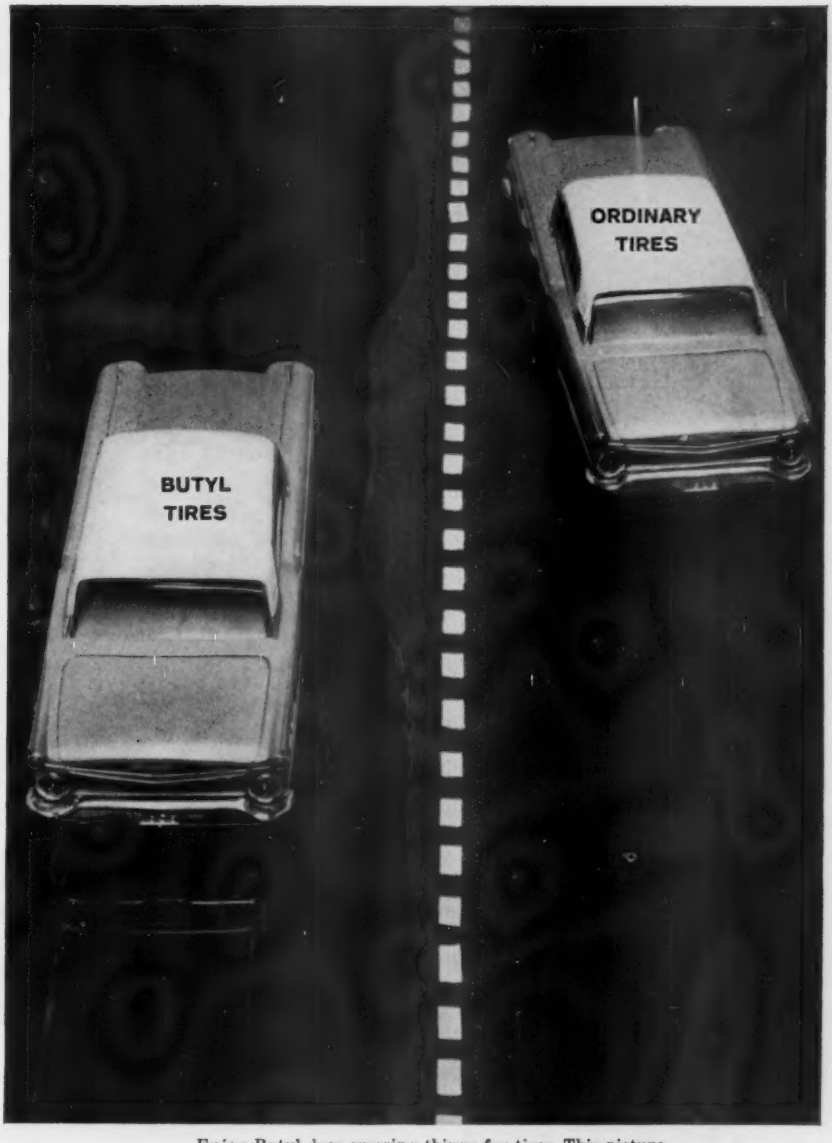
Silvertex Coated Work Gloves

► Surety Rubber Co., Carrollton, Ohio, has announced the availability of new low cost Silvertex coated work gloves with built-in toughness for longer on-the-job life. According to the company, the Silvertex coating insures maximum resistance to most industrial chemicals. Silvertex is also snag and abrasion resistant and its reflec-

tive quality helps to keep the worker's hands cool and comfortable. The coating will not crack or peel and remains pliable for the life of the glove, the company states. Surety Silvertex gloves are available in eight different styles including knit wrist, band top, gauntlet and safety cuff. Knit wrist and band top styles are also made with ventilated backs for maximum coolness and the gauntlets are available in three sizes. All styles are of molded curved finger design and wing thumb construction for greater hand comfort and longer wear life and are produced in jumbo sizes.

Firestone Collapsible Tank

► Lightweight rubberized fabric tanks that can be collapsed into small bundles have been developed for commercial fishing boats by Firestone Tire & Rubber Co., Akron, Ohio. Called Fabritank, the unit weighs only 175 pounds, yet has a capacity of 1,550 gallons. Since it can be collapsed into a small bundle after the fuel is exhausted, it can be stowed on board in some out-of-the-way location such as the roof of the pilothouse. According to Firestone, prior to the use of Fabritanks, expendable 50-gallon drums were used to carry auxiliary diesel fuel. When the drums were emptied, they were tossed overboard to make room for more cargo.



Enjay Butyl does amazing things for tires. This picture demonstrates how tires of Enjay Butyl stop faster on wet road than ordinary tires do on dry road.

ENJAY BUTYL RUBBER MAKES TIRES PERFORM BETTER

A revolutionary new tire is being made today. It's made of Enjay Butyl rubber to bring new highs in traction and shock absorption while allowing designers greater freedom in tread and cord design Butyl thus enables tire manufacturers to produce tires with unique silence, safety, appearance and comfort.

SAFETY AND SILENCE — So effective is the traction of Enjay Butyl tires, that they stop up to 30% faster than ordinary tires! Stop faster on wet roads than other tires do on dry! And Butyl tires will not screech on any corner at any speed!

RIDING COMFORT — Because Butyl absorbs shock energy more completely, Butyl tires literally upgrade riding comfort in any car. Detroit engineers report tires of Butyl will help minimize the need for major engineering changes to overcome vibration and noise in tomorrow's new cars.

UPGRADES OTHER PARTS, TOO — Enjay Butyl is already used in more than 100 places in today's cars — parts such as inner tubes, weatherstrips, shock absorbers, motor mounts. Let us show you how Butyl can help make better rubber products. Call or write your nearest Enjay office.

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Disposable Polyethylene Boots

► A new disposable polyethylene boot has been developed by Plasticsmith, Inc., Box 1071, Pittsburg, Calif. Called Footgard, the boot is made of lightweight polyethylene film and is packaged and sold in rolls of convenient sizes primarily for use by technicians in laboratories where control of the spread of contaminating elements is vital.

Footgard is designed to be pulled on over the wearer's regular shoes and can be worn open at the top or closed with the addition of a rubber band or paper clip. The boots are watertight and under normal conditions can be worn for several hours before the film wears through. When leaving the area of contamination, the boots are easily slipped off and discarded. Footgard boots are packaged in rolls of 50 and 100 boots per roll.

Vanguard Vacuum Cleaner Hose

► Republic Rubber Division of the Lee Rubber and Tire Corp., Youngstown, Ohio, has announced its entry into the swimming pool accessory field with what is said to be a unique line of plastic vacuum cleaner hose. Called the Vanguard, the new hose has a 100 per cent extruded vinyl plastic cover which is fabricated by special equipment in a continuous cycle. The plastic itself is of a specially formulated chemical nature and a double layer is used over the wire reinforcement which enables the hose to stand up longer to abrasive wear, according to the company.

The use of strong, rust-resistant wire assures greater crush resistance and makes the lightweight Vanguard hose easily portable and extremely durable. The hose is color-styled and available in 12½, 25, 27½ and 50 foot lengths without any external or internal type of coupling. A new feature, the Vacuum-Loc allows a hose splice to be made in three minutes and permits intermediate lengths to be cut and spliced readily by the dealer.

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PLASTIC and RUBBER
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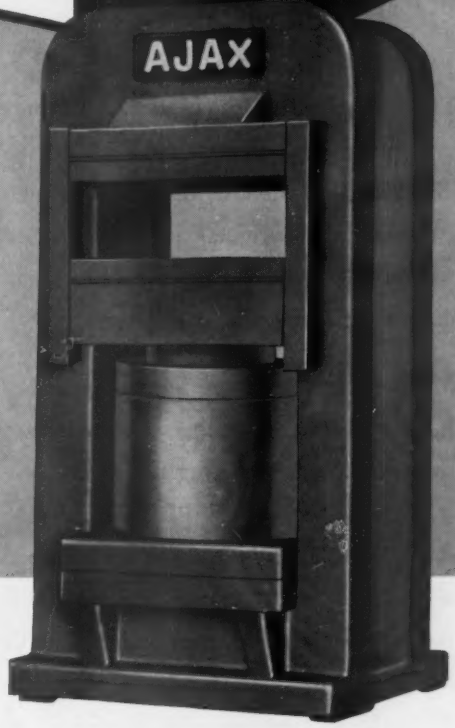

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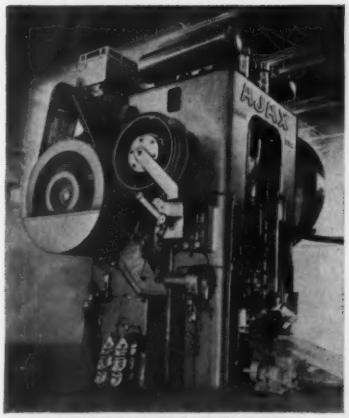

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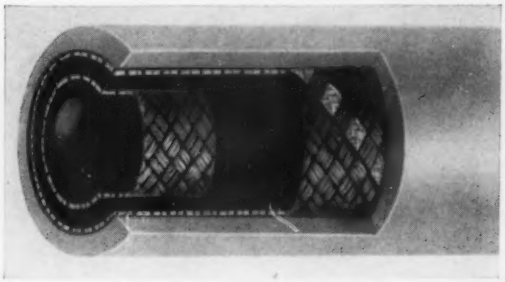
Further details are easily obtained by writing to:

Secretary,

INSTITUTION OF THE RUBBER INDUSTRY
4, KENSINGTON PALACE GARDENS
LONDON, W.8., ENGLAND
Telephone: Bayswater 9101

Color Guard Gasoline Pump Hose

► Acme-Hamilton Manufacturing Corp., Trenton 3, N. J., has developed a colored gasoline pump hose for use in service stations. Called Color Guard, the hose is said to be resistant to deterioration caused by ozone-cracking, weathering and abrasion. The color permeates the entire cover and resists oil, gas and abrasion. The hose



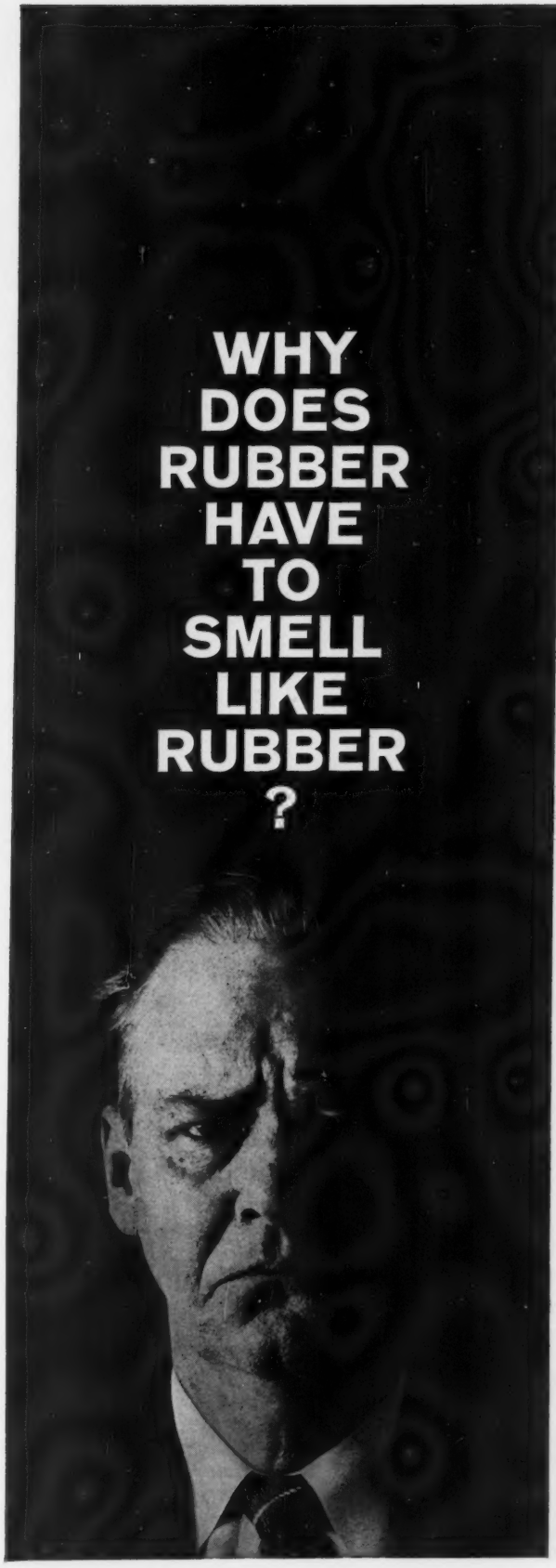
carcass is vertically braided, with static wire included to dissipate static electricity. The tube is compounded of high grade synthetic rubber. According to the company, the hose's sturdy, flexible construction prevents damage if run over by cars or crushed at the curb. Color Guard can be cleaned simply by wiping with a white wall cleaner or a detergent. The hose is available in red, yellow, green or white.

Tuffy-Dux Duck Decoys

► Western Plastics Manufacturing Co., Oakland, Calif., is manufacturing lifelike duck decoys made from a versatile Geon vinyl plastic material. The ducks are rotationally-cast from a plastisol based on Geon vinyl resin supplied by B. F. Goodrich Chemical Co. The company reports that the decoy's hide is tough, flexible and durable, and provides a natural, relaxed appearance. The colors are fused into the vinyl and can't rub or peel off. Resistant to shot charges at 25 yards or more, the Tuffy-Dux are self-righting, shed water like a live duck, and will not shine or glisten to flare the ducks. The decoys are equipped with a push-pull type valve and are easily inflated by mouth. The company also manufactures both drakes and hens in canvasback, sprig, mallard, bluebill, and redhead species.

All Star Sport Kit

► A sport kit for all stars, junior size, is being marketed by the Barr Rubber Products Co., Sandusky, Ohio. Called the All Star Sport Kit, the package includes a football, a basketball, a basketball hoop, and an official's whistle. The package comes assembled with a display rack and is ready to sell on sight.



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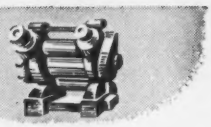
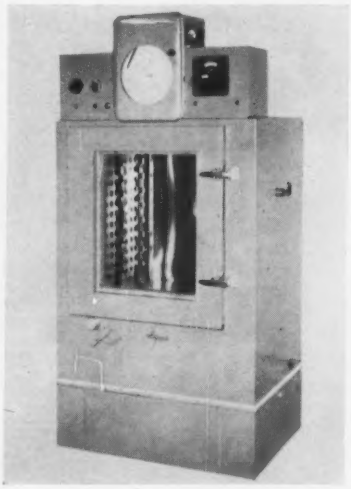


Tensile Tester Hot-Cold Chamber

► Designed to cover a temperature range of —65°F. to 500°F., the hot-cold chamber announced by Electric Hotpack Co., Inc., Cottman and Melrose, Philadelphia 35, Penna., is said to provide accurately controlled test environments for tensile strength analysis of rubber and related



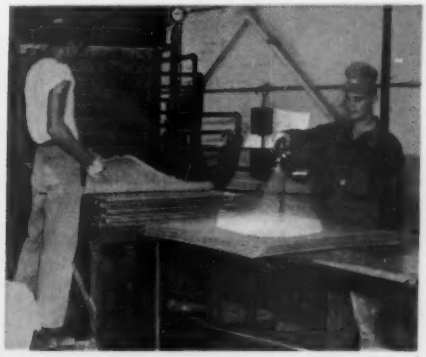
materials. A built-in air circulation system provides temperature uniformity and even CO_2 dispersal. The unit's controls include separate thermostats for operation above and below ambient temperatures, and automatic overtemperature devices to prevent thermal damage to the test load in event of main control malfunction or misadjustment. The temperature chart recorder provides a 24-hour record of chamber temperatures.

Dillon Calibrating Machine

► Weights from several ounces to 20,000 pounds can be tested with a claimed accuracy of 99.8 per cent by a calibrating machine made by W. C. Dillon & Co., Inc., 14620 Keswick St., Van Nuys, Calif. Originally designed for setting the gradations of Dillon dynamometers and other precision instruments, the machine is also adaptable to other manufacturers' systems. It operates by balancing a test object locked into place against a set of weights certified by the Bureau of Standards. Pivot points on a primary lever provide load ratios from 10 to 100:1. The machine is able to detect weight changes in objects of pinhead size by means of a null balancing system based on a mirror-and-lens arrangement.

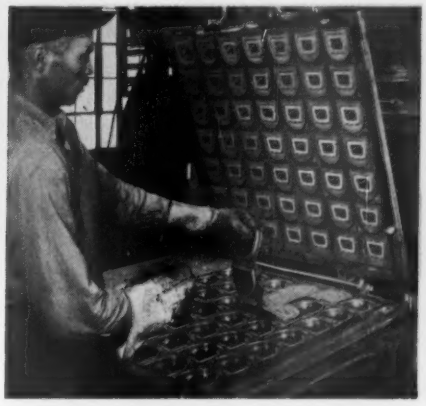
SILICONE NEWS from Dow Corning

Pop Out Perfect Products



Water-dilutable emulsions, solvent soluble fluids, greaselike compounds, different forms for different uses. Whatever you make . . . if it's molded of rubber — you can count on Dow Corning development engineers to formulate a silicone mold lubricant that'll release it efficiently and economically!

More Cost-Saving Silicones . . . In other areas of the rubber industry, too, Dow Corning Silicones have proved to be time and money savers: as electrical insulation



for mill and mixer motors; as anti-adhesive coatings for bags, containers and interleaving; as heat-resistant paints that also resist weathering and corrosive atmospheres; as lubricants for ball bearings; and as Silastic® gums and bases for compounding silicone rubber stocks to meet severe performance requirements. For more information about silicone release agents or other silicones for the rubber industry, write Dow Corning, Dept. 9223.

Dow Corning Silicone Mold Lubricants Assure Finer Details, Fewer Rejects

Toys and dolls, mats and heels, tires and tile — all kinds of rubber products — pop out cleanly, time after time after time, from molds lubricated with Dow Corning Silicones. These silicone release agents give uniform stick-free release . . . assure sharp surface detail, reduce rejects to a bare minimum, increase profits.

Dow Corning mold lubricants help you realize noteworthy savings, too . . . practically eliminate the need for cleaning molds. In turn, mold downtime is reduced . . . service life increased. New production efficiency, better looking products, lower maintenance costs, less waste . . . advantages like these have led more and more molders of rubber products to standardize on Dow Corning silicone release agents.

Easy and economical to use, Dow Corning mold lubricants are available in a variety of forms . . . for all types of rubber . . . for all types of molds.

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COLD OIL-EXTENDED POLYMERS	1703† 1707* 1708* 8200* 8201**	Offers the superior properties of cold polymers at substantial economy.

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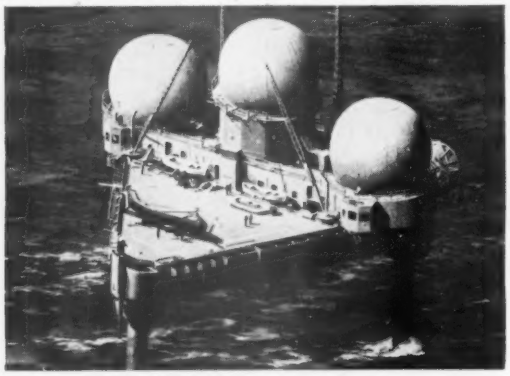
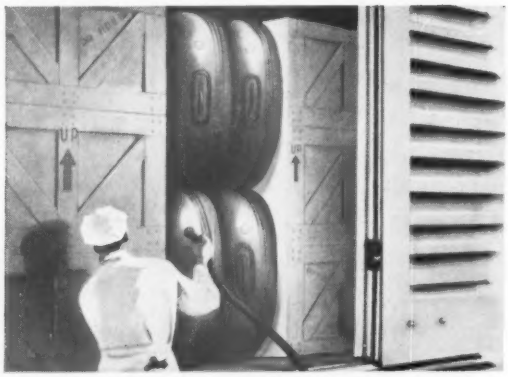


"Texas Tower" radomes of rubberized nylon are supported by interior air pressure. Nylon base fabric by Wellington Sears.

INFLATABLES



Inflatable dunnage bags are made of neoprene-coated nylon enclosing rubber air chamber. Wellington Sears base fabric.

COLLAPSIBLES

Collapsible fuel tank, made of rubberized nylon fabric, is a filling station dropped from the air. Base fabric by Wellington Sears.

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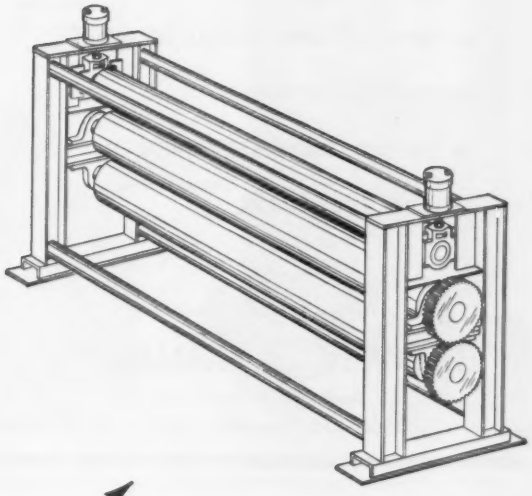

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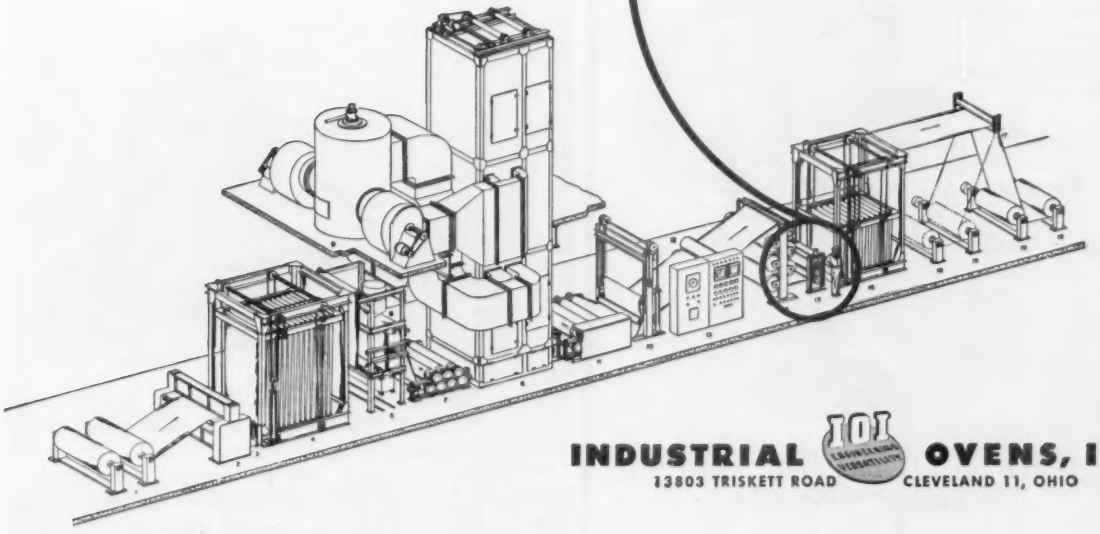

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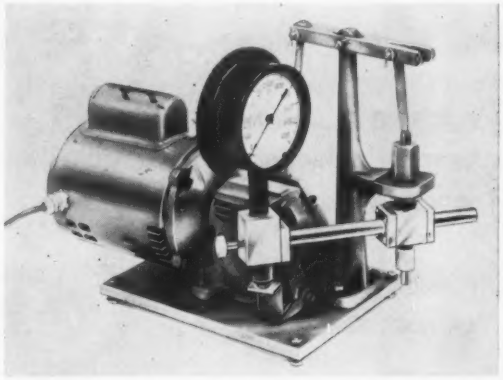
Laboratory Homogenizer

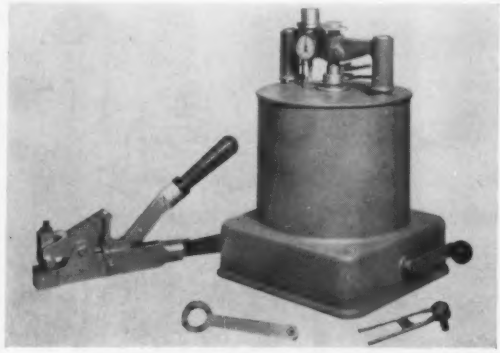
► A high pressure laboratory homogenizer that can reduce particles to less than one micron has been developed by the C. W. Logeman Co., 633 Bergen St., Brooklyn 38, N. Y. The device operates at a pressure range from 100 to 3000 psi



and processes samples from 30 cc's to 8 gallons an hour. Design features are said to facilitate disassembly for sterilizing and autoclaving. The unit is guaranteed by the company to give identical results obtained on large production homogenizers.

Plasticity Tester

► Using a modified parallel plate compression principle, the Wallace Rapid Plastimeter applies a compressive force to the specimen immediately after a conditioning period of ten seconds has brought the specimen to uniform temperature and thickness. Manufactured by Testing Machines,



Inc., 72 Jericho Turnpike, Mineola, N. Y., the unit makes a plasticity test in less than a minute and requires no cleaning between tests. The test is fully automatic and the reading remains on the dial until the next specimen is inserted in the unit. A specimen cutter furnished permits testing by unskilled personnel.

More Dependable, Economical and Safe . . .

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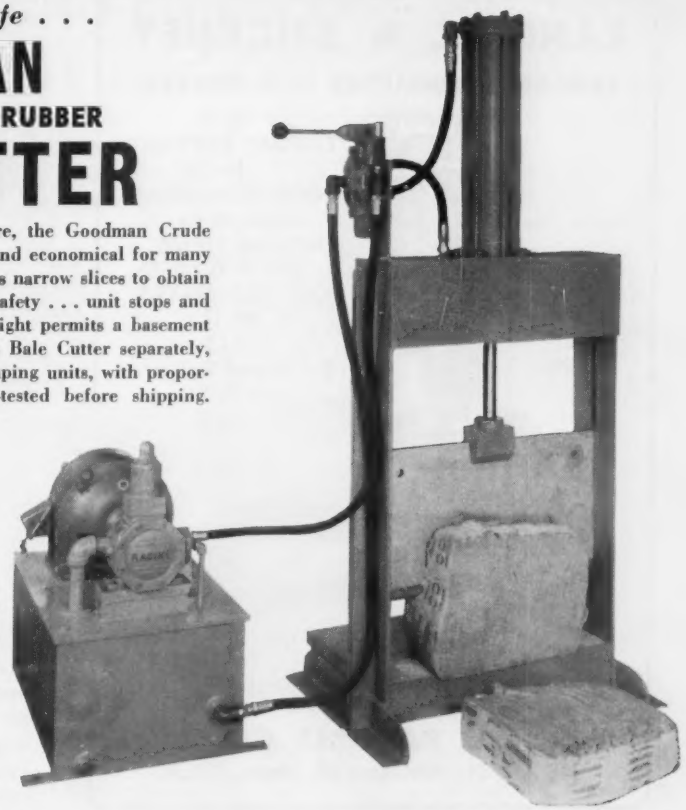
HYDRAULIC CRUDE RUBBER

BALE CUTTER

Tested at 3 times normal operating pressure, the Goodman Crude Rubber Bale Cutter has proved dependable and economical for many years. It can cut frozen bales easily, as well as narrow slices to obtain correct loads. Controls are located high for safety . . . unit stops and holds instantly on release. Its low overall height permits a basement set-up, if necessary. Optional choices include Bale Cutter separately, as well as 2, 5, or 7½ HP motor driven pumping units, with proportionally faster cutting cycles. Units power-tested before shipping.



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★ **Cuts Frozen Bales and Narrow Slices**

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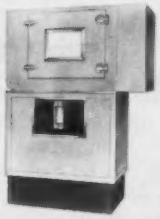

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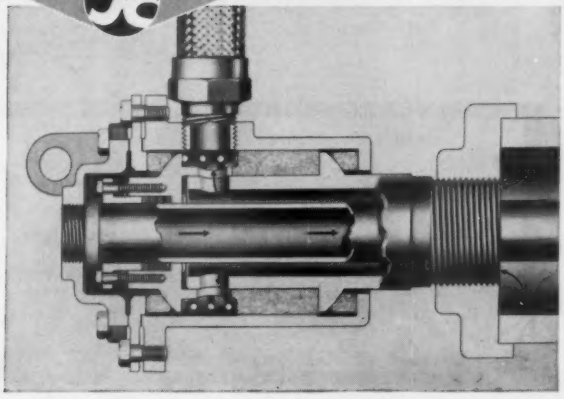

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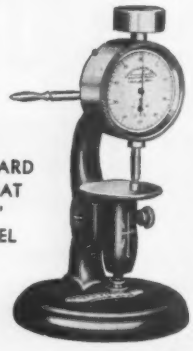

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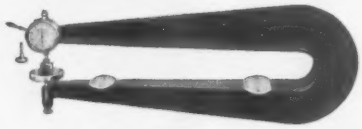

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Mechanical Convection Ovens

► Mechanical convection, batch type ovens are now available from Blue M Electric Co., 138th & Chatham St., Blue Island, Ill., for electric coponent processing, plastic heat treating, paint drying and baking, aging and curing. The bench style ovens with an 8 cubic foot heated volume are made in two temperature ranges: 100 to 300°F. and 100 to 500°F. All five models have a triple wall construction, Fiberglas insulation and all welded steel inside and outside. They are designed for production and testing in the rubber industry.

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► A Web Tension Meter for checking tension of cloth, plastic sheet or papers running in a press has been brought out by Tensitron, Inc., P.O. 185, Harvard, Mass. The meter can be hand held and easily inserted in the side of a moving sheet by cocking the trigger to outer guide rollers. A sensing roller linked to a gear train then rotates an indicating hand over a dial. The reading obtained with the 1-inch rollers is multiplied by the width of the sheet to calculate average tension.

TAYLOR-STILES cutters save you money

whether you

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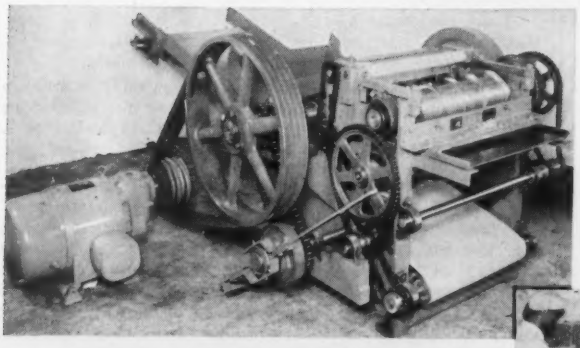
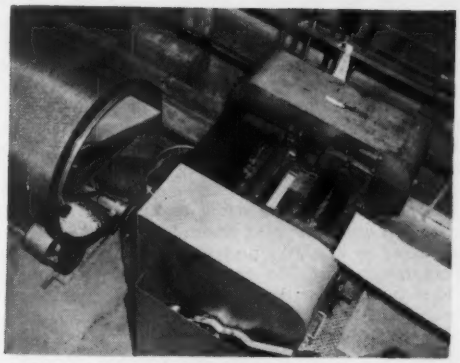


No matter what your plastic or rubber cutting needs, whether to cut plastic and rubber pellets to exact size, cut thin slabs into narrow strips, or cut blanks to exact size for molding, you will find Taylor-Stiles Cutters save you money. They give greater production (for example, up to 20 tons an hour of plastic pellets), power costs are low, and most users report unusual economy for knife sharpening, and general maintenance.



For full description of these machines, write for folder No's. 216, 213, 202.

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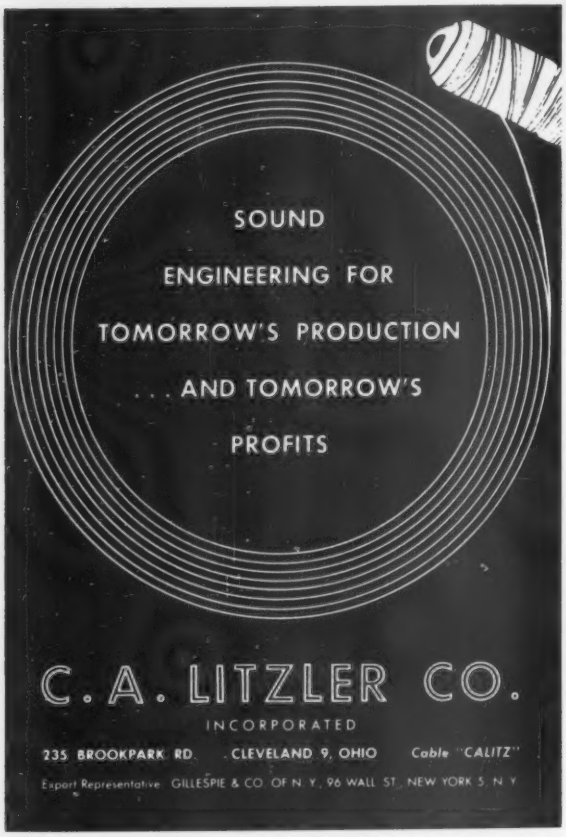
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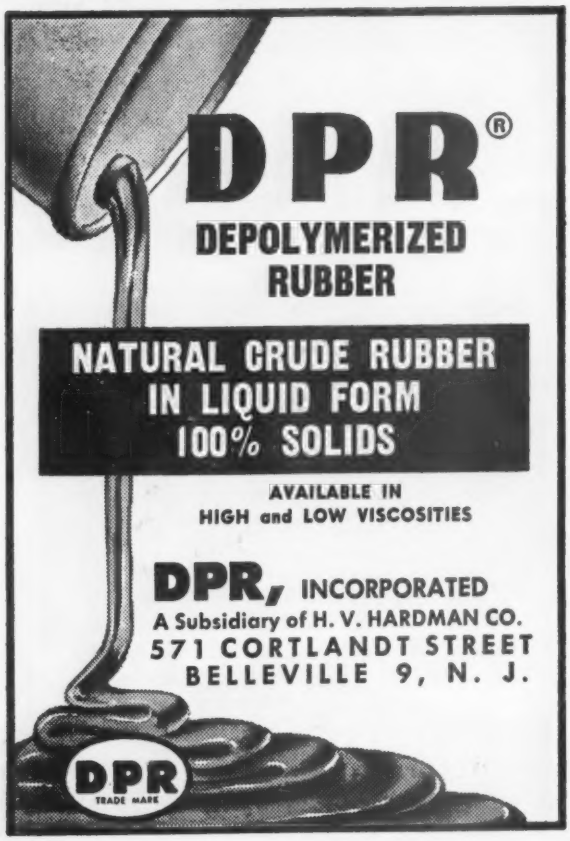
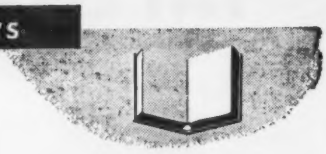


Reviews



Elsevier's Rubber Dictionary. Compiled by Rubber-Stichting, Delft, Netherlands. Distributed by D. Van Nostrand Co., Inc., 120 Alexander St., Princeton, N. J. 6 x 9 in. 1537 pp. $60.00.

Dictionary making has become an increasingly specialized field during the past years. As international contacts between scientists multiplied, it became evident that individual reference works were needed for each field of technology with its specialized terminology, and that more and more languages had to be represented to furnish the researcher with tools for handling the growing flood of foreign literature. One of the most ambitious projects in this polyglot publishing cycle has now been offered to the rubber engineer and technician in the form of a dictionary in ten languages: English, French, Spanish, Italian, Portuguese, German, Dutch, Swedish, Indonesian and Japanese.

Nearly 8000 entries cover virtually every aspect of laboratory, office and field terminology from botany to shoe manufacturing. The basic word list is in English, distinguishing American from British usage in order to tell "trucks" from "lorries" and "suspenders" from "braces." The corresponding terms in the other nine languages are then listed horizontally across two pages, according to a system proposed by the United Nations Educational, Scientific and Cultural Organization. In the second part of the dictionary, thumb-indexed alphabetical lists for each language give numerical keys to the basic English table. This original arrangement, facilitating swift reference, constitutes a distinct advance over previous vertical layout of multilingual dictionaries.

The former staff of Rubber-Stichting, the Dutch Rubber Foundation, has done an outstanding job in what must have been an extremely time-consuming, laborious project. It was materially assisted by rubber institutes in various countries whose languages were included, besides having publication underwritten by the Central Rubber Fund of Indonesia. The only major gap in comprehensiveness is the absence of Russian, particularly in the light of current Soviet literature exchanges. Minor defects in the binding and occasional typographical errors do not detract from the dictionary's usefulness for all those working and dealing in rubber, whether in connection with research, management, production or overseas trade.

•

Analytical Chemistry of Polymers. Part I. Analysis of Monomers and Polymeric Materials: Plastics—Resins—Rubbers—Fibers. Edited by Gordon M. Kline. Published by Interscience Publishers, 250 Fifth Ave., New York 1, N. Y. 6 x 9 in. 666 pp. $16.50.

Eleven previous volumes in the Interscience high polymer series dealt with the physical chemistry of these materials and the mechanisms of polymeric processes. The present collection of twenty essays by chemists from top U. S. companies in the field brings together descriptions of analytical methods that had been available only in research reports scattered through the technical literature, in unpublished company specifications or in laboratory manuals. The editor, an official of the National Bureau of Standards, has succeeded in assembling authoritative accounts of methods for assay and impurity determination in monomers, as well as characterization and determination of chemical and physical properties of polymers.

The wide range covered by the contributors is indicated by the chapter headings: (1) Acrylic Plastics, (2)

Alkyds, (3) Amino Resins, (4) Cellulose Derivatives, (5) Epoxy Resins, (6) Ethylene and Fluoroethylene Polymers, (7) Furan Resins, (8) Natural Resins, (9) Phenolic Resins, (10) Polyamides, (11) Polyesters, (12) Proteins, (13) Rubbers (Elastomers), (14) Silicones, (15) Styrene Monomers and Polymers, (16) Vinyl Polymers and Copolymers, (17) Ion Exchange Resins, (18) Plasticizers, (19) Synthetic and Natural Fibers, and (20) Drying Oils.

Willard P. Tyler of the B. F. Goodrich Research Center, in writing the chapter on elastomers, has achieved an excellent balance between a description of analytical methods and a critical evaluation of their applicability. Although his primary purpose was to present control and specification methods for crude and vulcanized natural and synthetic rubbers, he has also selected a number of test techniques of value in studying a particular type of polymer. A wealth of reference material was appended to permit an analyst to perform any of the reported tests.

Analytical chemists and other persons responsible for quality control in the resin and rubber fields will discover a mine of valuable technical information in this book. It is also recommended for students and technical personnel in user industries, such as plastics, textiles, paper, adhesives and protective coatings.

BOOKLETS, CATALOGS, etc.

PVP—Polyvinylpyrrolidone. Antara Chemicals Div., General Aniline & Film Corp., 345 Hudson St., New York 14, N. Y. 8½ x 11 in. 44 pp.

Physical and chemical properties of a recently developed polymer that has already been adapted to many industrial uses are presented in this handsomely printed brochure. Data are summarized from recent literature to indicate PVP's capabilities as a film-former, complexing agent, detoxifier, protective colloid and suspending agent, and binder and stabilizer. Products incorporating the material range from rubber gloves to pharmaceuticals. Properties that make it particularly suitable for the manufacture of resinous materials include its adhesiveness to glass, as well as its dispersing and protective colloid actions.

•

Sonic Bulletin 259. Sonic Engineering Corp., 146 Selleck St., Stamford, Conn. 8½ x 11 in. 6 pp.

This attractively illustrated folder describes equipment and techniques for the ultrasonic emulsification of liquids by means of a high-pressure jet stream. Fluid-dynamic forces of the liquids themselves are exploited to accomplish not only emulsification, but also hot-cold techniques for fine resin dispersions, defibring many materials such as asbestos, speeding up chemical reactions, reactivating powder catalysts, aeration, mixing and dispersions. Sketches illustrate single-pass operations for pre-mixed ingredients, as well as more complex semi- and fully-automatic production. Ultrasonic machines are used by the rubber industry for the production of carbon black emulsions.

•

Vari-Speed Motodrives. (Catalog M-592). Reeves Pulley Div., Reliance Electric and Engineering Co., Columbus, Ind. 8½ x 11 in. 96 pp.

A wide assortment of constant torque, variable horsepower units, called "Motodrives," is presented in this attractive catalog. Many photographs and drawings accompany the descriptions of styles, modifications and accessories available. The catalog includes construction features, specifications, speed and rating tables, and pricing information.

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REVIEWS (CONT'D)

Maglites in Vitons. (Bulletin No. 5914A). 7 pp. **Maglite K in Butyl White Sidewalls.** (Bulletin No. 5904A). 6 pp. Marine Magnesium Div., Merck & Co., Inc., Rahway, N. J. 8½ x 11 in.

The two latest publications in a series on rubber production present two applications of magnesia compounds. The first bulletin is a sequel to a previous publication on magnesia cures in the fluoroelastomer known as Viton. It shows results of a test evaluating the performances of different grades of magnesium oxides in Viton and stresses the importance of selecting the right grade to achieve certain properties, such as low compression set. The second describes the advantages of incorporating a specially calcined magnesia in light-colored butyl compounds exposed to the weather. The magnesia is said to protect such compounds against deterioration due to ultraviolet radiation, thus preventing tack of sidewalls exposed to sunlight. Both bulletins have helpful graphs, tables and photos to illustrate test results.

•

Kaykor Rigid Polyvinyl Chloride. Kaykor Industries, Inc., Yardville, N. J. 8½ x 11 in. 23 pp.

This catalog presents a line of rigid polyvinyl chloride products, their properties and applications. It traces the development of PVC as a construction material because of its durability, light weight, and electrical and thermal insulating properties. The chemical resistance of PVC has also led to its acceptance in a variety of chemical process equipment, ventilating hoods and ducts, stacks and small processing vessels. A special section devoted to fabrication and design of PVC contains an illustrated discussion of methods for joining it to itself.

•

Day Mogul Mixers. (Bulletin 1157). J. H. Day Co., Cincinnati 12, Ohio. 8½ x 11 in. 8 pp.

Special design features of heavy duty mixers, laboratory models and agitators are portrayed in this catalog. Large models are designed for heavy duty mixing and kneading of viscous fluids and semi-solids, while small models mix experimental batches and small production quantities under conditions simulating the characteristics of production work. Capacities range from 2½ to 600 gallons. Dimensional drawings of the major models are accompanied by a table of specifications.

•

Basic Pneumatic Control. Industrial Products Div., Westinghouse Air Brake Co., Wilmerding, Penna. 6½ x 9½ in. 28 pp.

This booklet is intended to acquaint machinery designers with the "systems engineering" approach to the selection and use of pneumatic controls. It achieves its purpose through 38 illustrations of basic pneumatic systems. It also mentions a wide variety of accessory devices, valves, and force and positioning devices to provide timing, sequencing and safety for accurate cycling and the achievement of automatic or semi-automatic control. Some industries benefiting from the systems are electronics, textiles, chemicals and automobiles.

•

Fisher Gram-atic Balances. (Bulletin FS-207). Fisher Scientific Co., 633 Greenwich St., New York 14, N. Y. 8½ x 11 in. 12 pp.

Three series of single-pan balances, plus a selection of special purpose equipment, are described in this bulletin. Complete performance, design and ordering data are given for analytical, multi-purpose and general purpose models with precision as fine as 0.001 mg. An introduction explains the constant load, substitution weighing principles of these measuring instruments. One of the special instruments is a remote-control unit particularly fitted for nuclear research work.

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Continex CF

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Continex SRF-NS
Continex HMF

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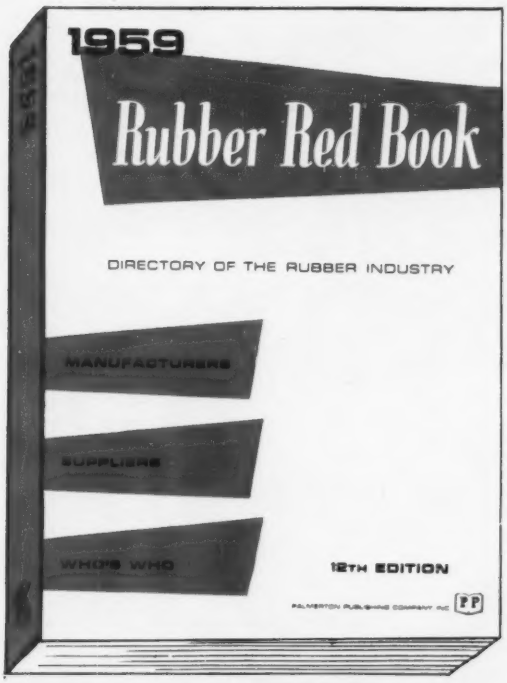

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MARKET REPORTS

TRENDS
NEWS
PRICES

Natural Rubber

Since our last report (October 1), the price of spot rubber on the New York Commodity Exchange has moved in the rather large range of 725 points, high for the period being 46.50c reached on October 29, and low being 39.25c reached on October 2 and 19. The average price of spot rubber for the month of October was 41.50c, based on 21 trading days, compared with an average of 40.22c in the previous month.

The Natural Rubber Bureau reports that today, the average yield of natural rubber in Malaya is 490 pounds per acre. Today, too, some 80,000 acres of estate rubber and 70,000 acres of smallholder rubber are being replanted with stocks that six years hence will bring in from 1,500 to 2,000 pounds per acre.

Production Modernization

This is a pattern of production modernization that has been constantly on the rise since 1947, when estates planted some 26,100 acres and small-holders some 4,500 acres in high-yielding stocks. In the 12 years since, not only has there been tremendous increase in the acreage out into high production trees, but the yield of new rubber has also been multiplied. In test tube stage now are stocks that can bring as much as 2,500 pounds per year per acre.

Looking to the future, NRB believes that natural will be in an increasingly better position to compete price-wise with synthetic.

About 1.2 million acres, approximately one-third of Malaya's total 3.5 million acres of rubber, are replanted and new-planted with high-yielding stocks. Particularly significant is the fact that last year some 70,000 acres of smallholder rubber were replanted, over 15 times as much as the 4,400 acres replanted only ten years ago.

Malayan smallholdings run an average of four to six acres. When a section of this acreage is put aside for six years, there is a real investment in the future on the part of the rubber farmer involved, NRB states.

Replanting Costs High

While it is true he gets the equivalent of U.S. $200 per acre replanted, a good deal of this goes into replanting costs. Only a real belief in the future of rubber and the stability of the Malayan government could induce the amount of smallholder replanting that is now taking place.

With American industry leaders forecasting that by 1965 world consumption of all rubber could run to upwards of 4.5 million tons as compared to current consumption of approximately 3.55 million tons, the optimism of Malayan replanters in the future of natural rubber would seem to be justified.

NEW YORK, NOVEMBER 2, 1959

Price Data

Closing Rubber Prices on New York Commodity Exchange

FROM OCT. 1 TO OCT. 31

Oct.	Spot	Nov.	Jan.	Mar.	Sales
1	39.50	37.50	34.65	33.90	89
2	39.25	37.25	35.35	33.60	47
3	....	....	....	....	...
4	....	....	....	....	...
5	40.00	36.25	33.80	33.10	56
6	39.50	36.45	34.30	33.50	24
7	39.50	36.50	33.98	33.40	21
8	39.50	36.70	34.30	33.65	34
9	40.25	37.40	34.46	33.85	44
10	....	....	....	....	...
11	....	....	....	....	...
12	....	....	....	....	...
13	40.75	37.90	34.95	34.25	26
14	40.50	37.35	34.60	33.70	39
15	41.00	37.90	35.05	34.15	65
16	40.50	37.10	34.70	33.97	28
17	....	....	....	....	...
18	....	....	....	....	...
19	39.25	36.80	34.40	33.80	20
20	40.00	37.60	35.27	34.50	111
21	41.25	38.80	36.25	35.10	130
22	40.50	38.70	35.95	34.90	110
23	42.00	40.74	36.90	35.75	34
24	....	....	....	....	...
25	....	....	....	....	...
26	45.25	43.90	38.00	36.50	190
27	45.00	43.65	38.10	36.50	105
28	45.50	44.25	38.85	36.95	102
29	46.50	43.50	38.70	36.70	68
30	46.00	43.50	38.65	36.55	105
31	....	....	....	....	...

Outside Market

No. 1 Ribbed Smoked Sheets:	
Spot	.46
Nov.	.43⅞
Dec.	.40¼
Thin Latex Crepe:	
Spot	.49
Thin Brown Crepe, No. 2	.40
Flat Bark Crepe	.37½

London Market
(Standard Smoked Sheets)

Jan.-Mar.	37.11 — 37.26
Apr.-June	35.50 — 35.65

Singapore Market
(Standard Smoked Sheets)

Dec.	36.44 — 36.53

Middling Upland Quotations

	Oct. 1	October 30		
	Close	High	Low	Close
Dec.	32.11	32.41	32.39	32.41
Mar.	32.54	32.88	32.83	32.88
May	32.76	33.13	33.12	33.11

Notes & Quotes

Speaking at the American Trucking Association convention recently, Guy Gundaker, Jr. and John T. Callahan, vice-presidents of the B. F. Goodrich Tire Co., stated that a great surge of business growth is coming in the 1960's. It was predicted that replacement tire sales will reach 78 million by 1965. Truck tire sales are expected to reach 14 million by 1965. Sales of all types of pneumatic tires are expected to soar to 145 million units by mid-1960.

Synthetic Rubber

Consumption of new rubber in the United States for the month of September amounted to 146,128 long tons as compared with the 137,951 long tons consumed during August. A new monthly high for production of synthetic rubber was established with 119,777 long tons for September, as compared with the previous peak of 119,031 long tons recorded in August, 1959, according to the Rubber Manufacturers Association.

Consumption of all types of synthetic rubber in September amounted to 96,546 long tons, compared with August's consumption of 91,037 long tons. Synthetic rubber accounted for 66.07 per cent of total new rubber consumption, as compared with the August ratio of 65.99 per cent. For the first nine months of 1959 the ratio was 65.49 per cent, against 64.39 per cent for the same period of 1958.

Synthetic Exports Up

In the first nine months of the current year, a total of 216,100 long tons of synthetic rubber were exported from the United States. In the first nine months of the preceding year a total of 143,395 long tons were exported. Exports of synthetic rubber in 1959 should approach the 270,000 long ton mark, a fair amount by any reckoning. Last year, something over 193,000 long tons were exported from the United States. In fact, the previous high was a little over 203,000 long tons set in 1957.

Many in the industry are of the opinion that exports of synthetic rubber will taper off in the next few years because of new synthetic capacity overseas. A sharp decline in synthetic exports will, of course, cause some readjustments on the local scene.

It is not expected, however, that domestic producers of synthetic will experience too many difficulties. The markets for synthetic rubber in the United States are increasing each year. Population increases in this country will account for greater demand.

Still Untapped Markets

Also to be considered, are the still virtually untapped markets in South America, India, Africa, etc. Rising industrialization in these areas will account for ever-growing demands for synthetic rubber.

The domestic producer, of course, will have to compete for these new markets with European producers and the question of landed price will assume new and more significant bearing upon the situation. In any event, the synthetic rubber industry can look forward to greater consumption in the years that lie ahead, current trends indicate.

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NAME_____ TITLE_____

COMPANY_____

STREET_____

CITY_____ ZONE_____ STATE_____

Dry Rubber

(per pound carload)

Butadiene-Acrylonitrile Types

Butaprene NF	.4900
Butaprene NH	.6500
Butaprene NL	.5000
Butaprene NXM	.5800
Chemigum N1NS	.6400
Chemigum N3NS and N5	.5800
Chemigum N6	.5000
Chemigum N6B	.5000
Chemigum N7	.5000
Chemigum N8	.5000
Chemigum N600	.5000
Herecol N-33	.6800
Hycar 1001 and 1041	.5800
Hycar 1002	.5000
Hycar 1014	.6000
Hycar 1042 and 1043	.5000
Hycar 1051	.5800
Hycar 1052	.5000
Hycar 1053	.5000
Hycar 1072	.6400
Hycar 1203	.4600
Hycar 1312	.5000
Hycar 1411	.6200
Hycar 1432	.5900
Hycar 1441	.6200
Paracril AJ	.4850
Paracril B and BJ	.5000
Paracril BLT and BJLT	.5000
Paracril C and CLT	.5800
Paracril CV	.5900
Paracril D	.6500
Paracril 18-80	.6000
Paracril OZO	.4600
Polysar Krynac 800	.5000
Polysar Krynac 801	.5800
Polysar Krynac 802	.5000
Polysar Krynac 803	.5000

Butadiene-Styrene Types

Ameripol 1000	.2410
Ameripol 1001	.2410
Ameripol 1002	.2435
Ameripol 1006	.2410
Ameripol 1006 (crumb)	.2475
Ameripol 1007	.2410
Ameripol 1009	.2475
Ameripol 1009 (crumb)	.2590
Ameripol 1011	.2475
Ameripol 1012	.2425
Ameripol 1012 (crumb)	.2490
Ameripol 1013	.2410
Ameripol 1013 (crumb)	.2615
Ameripol 1500 and 1501	.2410
Ameripol 1502	.2410
Ameripol 1703	.2060
Ameripol 1705	.2035
Ameripol 1707	.1910
Ameripol 1708	.1910
Ameripol 1710	.1885
Ameripol 1712	.1885
Ameripol 1805	.1550
Ameripol 4600	.2410
Ameripol 4650	.1820
Ameripol 4651	.1770
Ameripol 4652	.1425
Ameripol 4654	.1870
Ameripol 4655	.1820
Ameripol 4700	.1750
Ameripol 4750	.1545
Ameripol 4751	.1400
Ameripol 4752	.1600
Ameripol 4753	.1480
ASRC 1000	.2410
ASRC 1001 and 1004	.2410
ASRC 1006	.2410
ASRC 1009	.2475
ASRC 1018	.2700
ASRC 1019	.2650
ASRC 1500	.2410
ASRC 1502	.2410
ASRC 1503	.2625
ASRC 1703	.2060
ASRC 1708	.1910
ASRC 1712	.1885
ASRC 1713	.1750
TSRC 3105 and 3106	.2410
ASRC 3110	.2600
Baytown 1600	.1930
Baytown 1601	.1930
Baytown 1602	.1930
Baytown 1801	.1760
Baytown 1803	.1740
C-102 (Shell)	.2300
Carbomix 3750	.1820
Carbomix 3751	.1545
Carbomix 3752	.1845
Carbomix 3753	.1640
Carbomix 3756	.1569
Carbomix 3757	.1480
Carbomix 3758	.1545
Carbomix 3760	.1496
CB-102 (Shell)	.1850
Copo 1500	.2410
Copo 1502	.2410
Copo 1505-NS	.2610
Copo 1712	.1885
Copo 1773	.2060
Copo 1778	.1910
Copo 3700	.1725
Copo 3701	.1750
Copo 3900	.2310
FR-S 146	.2410
FR-S 158	.3000
FR-S 173	.2060
FR-S 178	.1910
FR-S 181	.2410
FR-S 182	.2410
FR-S 184	.1885
FR-S 1000	.2410
FR-S 1001	.1410
FR-S 1004	.2410
FR-S 1006	.2410
FR-S 1007	.2410
FR-S 1009	.2475
FR-S 1010	.2600
FR-S 1012	.2425
FR-S 1013	.2410
FR-S 1014	.2810
FR-S 1500	.2410
FR-S 1502	.2410
FR-S 1703	.2060
FR-S 1710	.1885
FR-S 1712	.1885
Gentro 1500	.2410
Gentro 1712	.1885
Gentro-Jet 9152	.2080
Gentro-Jet 9153	.1820
Gentro-Jet 9154	.1845
Gentro-Jet 9250	.1580
Gentro-Jet 9251	.1640
Gentro-Jet 9252	.1670
Gentro-Jet 9275	.1500
Naugapol 1016	.2650
Naugapol 1018	.2700
Naugapol 1019	.2650
Naugapol 1022	.2950
Naugapol 1023	.3150
Naugapol 1503	.2625
Naugapol 1504	.0330
Naugapol 6003	.2700
Naugapol 6100	.3100
OB-102 (Shell)	.1825
OB-104 (Shell)	.1475
OB-106 (Shell)	.1510
OB-110 (Shell)	.1410
OB-111 (Shell)	.1540
OB-113C (Shell)	.1750
OB-114C (Shell)	.1420
Philprene 1000	.2410
Philprene 1001	.2410
Philprene 1006	.2410
Philprene 1009	.2475
Philprene 1018	.2700
Philprene 1019	.2650
Philprene 1500	.2410
Philprene 1502	.2410
Philprene 1503	.2625
Philprene 1601	.1930
Philprene 1603	.1940
Philprene 1605	.1900
Philprene 1703	.2060
Philprene 1708	.1910
Philprene 1712	.1885
Philprene 1803	.1740
Philprene 1805	.1550
Plioflex 1006	.2410
Plioflex 1500C	.2410
Plioflex 1502	.2410
Plioflex 1507	.2410
Plioflex 1703	.2060
Plioflex 1710C	.1885
Plioflex 1712C	.1885
Plioflex 1713	.1750
Plioflex 1714C	.1725
Plioflex 1773	.2060
Plioflex 1778	.1910
Polysar Kryflex 200	.2510
Polysar Krylene	.2410
Polysar Krylene NS	.2410
Polysar Krynol 651	.1885
Polysar Krynol 652	.1910
Polysar S	.2410
Polysar S-50	.2410
Polysar S-X 371	.2550
Polysar SS-250	.2875
S-1000	.2300
S-1002	.2325
S-1006	.2300
S-1009	.2400
S-1011	.2325
S-1013	.2300
S-1500	.2300
S-1502	.2300
S-1509	.2300
S-1600	.1825
S-1602	.1825
S-1605	.1800
S-1703	.1950
S-1707	.1800
S-1709	.1775
S-1710	.1775
S-1712	.1775
S-1803	.1650
S-1804	.1750
S-7701	.1850
SP-103 (Shell)	.2900
Synpol 1000	.2410
Synpol 1001	.2410
Synpol 1002	.2435
Synpol 1006	.2410
Synpol 1007	.2410
Synpol 1009	.2475
Synpol 1012	.2425
Synpol 1061	.2410
Synpol 1500	.2410
Synpol 1502	.2410
Synpol 1551	.2410
Synpol 1703	.2060
Synpol 1707	.1910
Synpol 1708	.1910
Synpol 1711	.1900
Synpol 1712	.1885
Synpol 8000	.2410
Synpol 8150	.1930
Synpol 8200	.1910
Synpol 8201	.1750
Synpol 8250	.1740
Synpol 8253	.1584
Synpol 8254	.1545
Synpol X-274	.2550

Butyl Rubbers

Enjay Butyl 035 and 150	.2300
Enjay Butyl 165 NS	.2400
Enjay Butyl 215	.2300
Enjay Butyl 217	.2300
Enjay Butyl 218	.2300
Enjay Butyl 268 NS	.2400
Enjay Butyl 325	.2300
Enjay Butyl 365 NS	.2400
Polysar Butyl 100	.2450
Polysar Butyl 101	.2775
Polysar Butyl 200 and 300	.2450
Polysar Butyl 301	.2550
Polysar Butyl 400	.2450

Chlorosulfonated Polyethylene

Hypalon 20	.7000
Hypalon 30	.7000

Fluoroelastomers

Kel-F Fluorel	$15.00
Kel-F 3700	$16.00
Kel-F 5500	$16.00
Viton A	$10.00
Viton A-HV	$10.00
Viton B	$13.00

Neoprene

	(prices l.c.l.)
Neoprene Types AC and CG	.5500
Neoprene Type AD	.5500
Neoprene Type FB	.6500
Neoprene Type GN	.4100
Neoprene Type GN-A	.4100
Neoprene Type GRT	.4200
Neoprene Type KNR	.7500
Neoprene Type S	.4200
Neoprene Type W	.3900
Neoprene Type WB	.4100
Neoprene Type WHV	.3900
Neoprene Type WRT	.4500
Neoprene Type WX	.4100

Polysulfide Rubbers

	(prices l.c.l.)
Thiokol Type A	.5000
Thiokol Type FA	.6900
Thiokol Type ST	1.2500

Silicone Rubbers*

	(prices l.c.l.)
GE (compounded)	2.50
GE Silicone Gum (not compounded)	4.00
Silastic (compounded)	2.50
Silastic (gums)	4.00
Union Carbide (gums)	4.00
Union Carbide (compounds)	2.50

Latex

(per pound carload)

Butadiene-Acrylonitrile Types

Butaprene N-300	[illegible] [1]
Butaprene N-400 and N-401	.5400 [1]
Chemigum 200	.4900 [1]
Chemigum 235 and 236	.5400 [2]
Chemigum 245	.4600 [1]
Chemigum 246	.4600 [1]
Chemigum 247	.4600 [1]
Chemigum 248	.4600 [1]
Hycar 1512	.4500 [3]
Hycar 1551	.5300 [3]
Hycar 1552	.4500 [3]
Hycar 1561	.5300 [3]
Hycar 1562	.4500 [3]
Hycar 1571	.5300 [3]
Hycar 1572	.4500 [3]
Hycar 1577	.4500 [3]
Tylac 640	.4500 [1]
Tylac 740	.4900 [1]
Tylac 840	.5300 [1]
Tylac 1640	.5400 [1]
Tylac 2241	.5300 [1]
Tylac 2430	.5000 [1]
Tylac 2570	.5300 [1]
Tylac 2830	.4500 [1]

Butadiene-Styrene Types

CL-101 (Shell)	.2800 [3]
Copo 2000	.2775 [3]
Copo 2101	.3000 [2]
Copo 2102	.3200 [2]
Copo 2105	.3200 [2]
Copo 2108	.3000 [2]
Copo 2109	.2775 [3]
Copo 2110	.3200 [2]
Copo 3852	.2900 [3]
FR-S 110	.3000 [2]
FR-S 150	.3000 [3]
FR-S 151	.2900 [2]
FR-S 174	.2950 [2]
FR-S 176	.2775 [2]
FR-S 2000	.2775 [3]
FR-S 2001	.2775 [3]
FR-S 2002	.3000 [3]
FR-S 2003	.3050 [3]
FR-S 2004	.3050 [3]
FR-S 2006	.2900 [3]
FR-S 2105	.3200 [3]
Naugatex 2000	.3375 [1]
Naugatex 2001	.3375 [1]
Naugatex 2002	.3500 [1]
Naugatex 2006	.3900 [1]
Naugatex 2105	.3600 [1]
Naugatex 2107	.3600 [1]
Naugatex 2108	.3600 [1]
Naugatex 2113	.3400 [1]
Nitrex 2612	.5000 [1]
Nitrex 2614	.4600 [1]
Nitrex 2614-A	.4600 [1]
Nitrex 2615	.5100 [1]
Nitrex 2615-A	.5100 [1]
Nitrex 2616	.5800 [1]
Nitrex 2617	.4600 [1]
Nitrex 2617-A	.4600 [1]
Nitrex 2619	.5700 [1]
Nitrex 2620	.5000 [1]
Nitrex 2625	.5000 [2]
Nitrex 2625-A	.5000 [1]
Nitrex J-6849	.5400 [1]
Pliolite 2000	.2775 [3]
Pliolite 2001	.2775 [3]
Pliolite 2076	.2900 [3]
Pliolite 2104	.3200 [3]
Pliolite 2105	.3200 [3]
Pliolite 2107	.3200 [3]
Pliolite 2108	.3000 [3]
S-2000 and S-2006	.2600 [2]
S-2101	.2600 [2]
S-2105	.2800 [2]
S-2108	.2900 [2]

Neoprene

Neoprene Latex 60	.4000 [2]
Neoprene Latex 571	.3700 [2]
Neoprene Latex 572	.3900 [2]
Neoprene Latex 601-A	.4000 [2]
Neoprene Latex 673	.5000 [2]
Neoprene Latex 735	.3800 [2]
Neoprene Latex 736	.3800 [2]
Neoprene Latex 842-A	.3700 [2]
Neoprene Latex 950	.4700 [2]

Polysulfide Rubbers

Thiokol Type MX	.8000 [3]
Thiokol Type WD-2	1.2500 [3]
Thiokol Type WD-6	.8000 [3]

Notes: (1) Freight allowed. (2) Freight extra. (3) Freight prepaid. *Covers a wide range of compounds. Readers are urged to check specific prices with producers.

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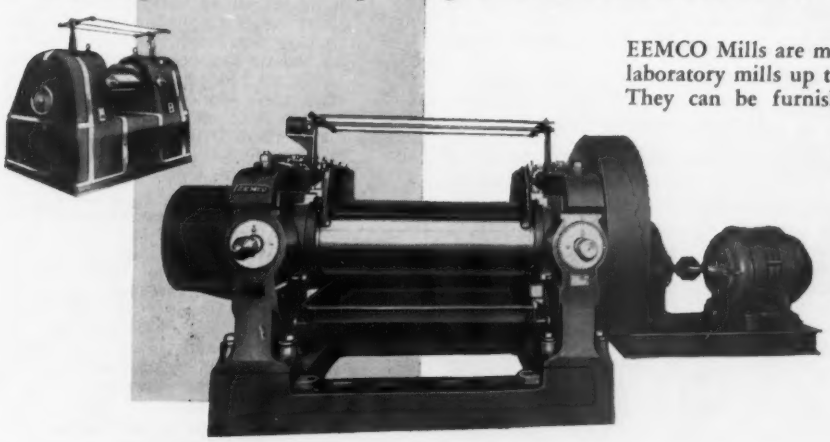

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MARKETS

(continued)

Reclaimed Rubber

In the first nine months of the current year, a total of 229,020 long tons of reclaimed rubber were produced in the United States, compared with the 185,859 long tons produced in the first nine months of the preceding year. Consumption in the first nine months of this year amounted to 216,862 long tons, against the 179,668 long tons of reclaim consumed in the first nine months of 1958.

Consumption of reclaimed rubber this year will likely approach the 280,000 ton level, the highest since 1955 when 312,781 long tons were consumed. Last year, 248,156 long tons of reclaimed rubber were used.

(Prices for All Areas Except Calif.)

	per lb.
Premium Grade Whole Tire	.11½
First Line Whole Tire	.11
Second Line Whole Tire	.10½
Third Line Whole Tire	.10¼
Fourth Line Whole Tire	.09¾
Black Carcass	.15¼
No. 1 Light Colored Carcass	.22
No. 1 Peel	.11
Butyl Tube Reclaim	.14
Natural Rubber Black Tube	.16
Natural Rubber Red Tube	.21
Natural Rubber Gray Tube	.21

Scrap Rubber

The Rubber Manufacturers Association reports that in the first nine months of this year, a total of 208,846 long tons of scrap rubber were consumed in the United States. As of August 31, 1959, there were 65,387 long tons of scrap in inventories.

Scrap rubber activity continues in a routine fashion. Tires continue to move fairly well and there seems to be a relatively good demand for tubes. Prices for all grades of scrap remain at consistent levels.

It now appears as if some 280,000 long tons of scrap rubber will be consumed in the United States in the current year. This figure, if attained, will be a good deal more than was expected by most quarters in the early part of the year.

(Prices Delivered Akron)

Mixed tires	ton	15.00
Light colored carcass	lb.	.05
No. 1 peelings	ton	35.00
No. 2 peelings	ton	28.00
No. 3 peelings	ton	23.00
Buffings	ton	16.00
Truck and Bus S.A.G.	ton	22.00
Passenger S.A.G.	ton	20.00
Natural Rubber Red Tubes	lb.	.07¼
Natural Rubber Black Tubes	lb.	.06½
Butyl Rubber Tubes	lb.	.06¼

Tire Fabrics

Market sources point out that there are strong indications that producers of high strength rayon tire cord as well as producers of nylon tire cord are prepared to follow up recent price cuts with more reductions. It is believed that nylon producers have their eye on the 1961 original equipment business.

At the moment, rayon continues to have a slight edge in price and it is figured that nylon would have to drop to 90-95c a pound before any sizable impact could be made upon the market. It is generally agreed that DuPont is the company to watch for any new price reductions.

The rayon producers, on the other hand, are apparently ready to match any nylon price reduction with one of their own. The president of Beaunit Mills recently stated "we're going down every time nylon goes down."

Israel Rogosin, president of Beaunit, agrees that more nylon and Tyrex price cuts are coming. He doubts, however, that nylon will be able to make any great inroads on 1961 original equipment tires. Beaunit, readying itself for all contingencies, plans to make nylon tire yarn and expects to have capacity up to 12 million pounds a year by 1961.

At present, there is said to be about a 70 million pound surplus capacity for nylon. Even with Firestone's new 10 million pound facility, nylon producers still do not have the capacity to take over all annual tire cord business. Rayon gets about 330 million pounds of the tire cord market annually.

While rayon and nylon prepare to do battle, however, there is every indication that they will be joined by some of the newer fibers. Dacron, Orlon and Terylene may succeed in making some market inroads in the next few years. There may even be considerable impact upon the entire tire cord picture.

At the moment, however, rayon fights to hold its own as nylon continues to make slow but sure headway.

(Prices f.o.b. Shipping Point)

Rayon Tire Cord

1100	lb.	.67½
1650	lb.	.67
2200	lb.	.67½

Nylon Tire Cord

210	lb.	1.82
840	lb.	1.47

Rayon Graded Fabric

1100	lb.	.69
1650	lb.	.63½
2200	lb.	.63

Cotton Chafers

8.9 oz. (per square yard)	lb.	.71
9.25 oz. (per square yard)	lb.	.69
11.65 oz. (per square yard)	lb.	.63
14.4 oz. (per square yard)	lb.	.72

Liquid Latex

Natural: The Rubber Manufacturers Association reports that in the first nine months of this year a total of 61,000 long tons of natural rubber latex were imported into the United States, compared with the 48,573 long tons imported in the first nine months of the previous year.

In the first nine months of 1959, 55,460 long tons of natural latex were consumed in the United States, against 49,322 long tons consumed in the first nine months of 1958. As of September 30, 1959, there were 11,930 long tons of natural rubber latex in inventories.

It appears as if natural latex consumption in 1959 will approach 75,000 long tons. This is interesting, for all during the year natural latex has been selling at or above the 40c level, that level at which natural latex historically meets buyer opposition. At the moment, natural latex is selling at about a 50-52c level at east coast ports in car load lots.

The rejection of historical influences can only be attributed to the great demand which has existed for most of the year. Whether these factors will continue to hold in the months that lie ahead is problematical.

Synthetics: U. S. Commerce Department figures show that in the first eight months of this year a total of 77,367 long tons of synthetic latex were produced in the United States and 69,159 long tons consumed. This compares with 50,825 and 47,312, respectively, in the first eight months of 1958. Synthetic latex seems headed for a 100,000 long ton consumption year in 1959, if it maintains its present pace.

Cotton

The price of middling uplands on the New York Cotton Exchange has moved in the extremely narrow range of 20 points since our last report (October 1), high for the period being 32.90c reached on October 1, and low being 32.70c reached on October 23 and five other days during the month. The average price of middling uplands for the month of October was 32.77c based on 21 trading days. This compares with an average of 32.99c in the previous month.

The International Federation of Cotton & Allied Textile Industries, meeting in Manchester, England, recently passed two resolutions which will be filed with the International Cotton Advisory Committee in Washington in the near future. One resolution calls for the removal of all government restrictions on trading in coton futures, and the other calls for complete freeing of world cotton markets.

The Federation blames low raw cotton prices in recent years on excessive commodity controls and price intervention on the part of governments. The Federation believes that it is in the general interest to hasten a return to free trading.

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Where there's business action, there's a businesspaper

. . . where there's rubber business, there's

RUBBER AGE

One of a series of advertisements prepared by the ASSOCIATED BUSINESS PUBLICATONS

Check the PROFIT POINTS of DAY

Gearless PONY MIXERS

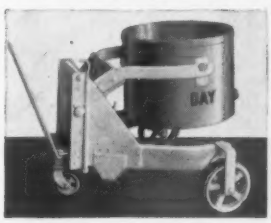
1. FAST, UNIFORM BLENDING of all ingredients being mixed. Agitator action insures against "dead spots" and stratification of materials—whether dry mixes, pastes or high viscosity liquids.

2. RUGGED, RIGID, TROUBLE-FREE construction makes DAY the standard of dependability. One piece cast frame assures absolute rigidity. Geared head motor drives agitators and can through roller chain and sprocket.

3. GUARANTEED PRODUCT PROTECTION from grease and oil. No bearings or stuffing boxes in the product zone.

4. QUICK, EASY REMOVAL OF AGITATORS from the batch. Counterbalanced head tilts easily by hand-wheel. Power tilting optional.

5. A MODEL FOR EVERY NEED with single motion or twin motion mixing action, one or two speed motors, in working capacities from 3 to 125 gals.



For full details, call in the Day field engineer in your area or write for Bulletin No. 500.

Mixer shown above, top, is Day Twin Motion Pony Mixer, having twin spindles with counter-rotating, overlapping blades. Shown immediately below is Day Single Motion Mixer. Day hydraulic lift trucks, left, and extra interchangeable cans, will further speed your production.

The J. H. DAY Co.

Division of The Cleveland Automatic Machine Co.

QUALITY MIXING, BLENDING, MILLING AND SIFTING MACHINES SINCE 1887

4918 Beech Street, Cincinnati 12, Ohio

STATISTICS of the industry

PERTINENT INDUSTRY DATA

Natural Rubber in the United States

(Including Latex and Guayule)

(All Quantities in Long Tons)

Year	New Supply	Consumption	Re-Exports	Stocks On Hand at End of Period
1931	501,788	355,200	25,609	322,000
1932	414,668	336,700	20,937	379,000
1933	418,902	412,400	20,576	365,000
1934	463,018	462,500	23,856	355,000
1935	467,146	495,500	11,391	303,000
1936	488,143	575,000	12,582	223,000
1937	600,479	543,600	7,902	262,204
1938	411,983	437,031	5,652	231,500
1939	499,473	592,000	13,125	125,800
1940	818,243	648,500	7,060	288,864
1941	1,029,007	775,000	5,376	533,344
1942	282,653	376,791	10,856	422,714
1943	55,329	317,634	20,815	139,594
1944	107,834	144,115	9,665	93,650
1945	135,672	105,429	6,743	118,715
1946	400,687	277,597	4,338	237,467
1947	688,354	562,661	4,101	129,038
1948	735,227	627,332	6,673	141,541
1949	660,792	574,524	6,253	106,619
1950	802,249	720,268	8,644	89,215
1951	733,048	454,015	2,603	76,569
1952	805,997	453,846	3,024	95,260
1953	647,150	553,473	8,376	112,316
1954	596,848	596,285	7,443	104,543
1955	635,174	634,800	10,611	110,105
1956	580,510	563,095	11,300	115,949
1957	499,121	539,761	10,146	100,901
1958	474,409	484,492	20,085	76,491
1958:				
Oct.	40,267	48,957	1,550	77,859
Nov.	42,484	43,877	3,140	75,335
Dec.	57,067	46,600	2,000	75,325
1959:				
Jan.	54,950	49,913	1,438	82,487
Feb.	48,917	47,345	1,561	79,657
Mar.	48,584	51,991	2,131	78,871
Apr.	34,828	40,850	1,700	78,900
May	45,451	38,777	1,967	82,983
June	45,111	48,570	2,350	85,010
July	47,527	47,545	1,323	80,059
Aug.	46,453	46,914	1,650	80,106
Sept.	41,420	49,582	1,480	76,935

Source: U. S. Department of Commerce.

U. S. Imports of Natural Rubber

Year	Dry		Latex		Total Imports
	Long Tons	Declared Value	Long Tons	Declared Value	
1936	467,064	152,072,496	19,852	6,659,899	486,916
1937	574,600	237,307,041	23,185	10,213,670	597,785
1938	397,640	125,373,864	11,944	4,168,127	409,584
1939	469,946	167,586,780	27,437	10,467,552	497,383
1940	781,202	303,308,823	33,789	14,593,466	814,991
1941	989,498	401,976,317	34,797	15,965,627	1,024,245
1942	266,276	112,537,426	10,646	5,630,667	276,922
1943	50,358	31,369,198	1,890	1,312,202	52,248
1944	103,847	73,908,549	3,091	2,092,211	106,938
1945	134,408	95,814,102	4,773	3,115,853	139,181
1946	376,502	228,796,110	8,421	5,843,085	384,923
1947	691,087	306,951,814	17,542	9,787,722	708,629
1948	702,293	290,849,177	32,745	18,288,223	735,038
1949	630,808	225,343,624	29,743	14,968,650	660,551
1950	747,109	416,222,598	54,401	41,764,486	801,510
1951	677,874	727,343,348	54,963	80,178,309	732,837
1952	756,987	578,179,519	48,228	40,563,116	805,215
1953	571,635	284,909,223	75,511	46,353,333	647,146
1954	522,364	219,098,143	74,483	42,755,029	596,847
1955	542,507	360,435,303	92,825	80,163,114	635,332
1956	499,479	334,990,045	71,709	61,795,844	564,321
1957	475,958	291,337,628	78,567	58,249,788	554,174
1958	406,059	153,127,066	67,593	45,047,040	473,652
1959:					
Jan.	46,376	26,671,747	8,574	5,982,352	54,950
Feb.	43,171	25,654,219	5,746	3,870,366	48,917
Mar.	41,545	24,138,084	7,039	4,775,577	48,584
Apr.	38,005	21,869,881	6,342	4,372,505	44,347
May	39,444	23,371,117	6,006	4,990,906	45,450
June	43,067	23,474,991	7,445	5,635,689	50,512
July	42,058	27,606,695	5,469	4,524,071	47,527

Source: Bureau of the Census, U. S. Department of Commerce.

World Production of Natural Rubber

(Including Latex)

(Long Tons)

Year	Malaya	Indonesia	Ceylon	Viet Nam & Cambodia	Latin America*	Rest of World*	Total*
1947	646,362	277,951	89,000	38,128	34,928	172,782	1,260,000
1948	698,189	432,349	95,000	43,935	29,158	225,557	1,525,000
1949	671,503	432,996	89,500	43,010	27,318	225,659	1,490,000
1950	694,090	696,472	113,500	48,482	26,902	280,299	1,860,000
1951	605,346	814,406	105,000	52,136	29,777	278,262	1,885,000
1952	584,238	750,494	96,500	63,134	35,475	261,211	1,790,000
1953	574,390	692,164	98,610	74,545	35,318	250,182	1,725,000
1954	584,435	738,670	93,935	78,024	26,833	280,112	1,802,500
1955	639,128	733,786	93,830	80,172	6,000	344,584	1,897,500
1956	568,550	686,667	95,389	89,072	22,457	336,015	1,857,000
1957	638,706	684,515	98,164	58,440	28,351	381,824	1,890,000
1958	663,644	614,561	100,196	103,613	26,268	446,718	1,955,000
1959:							
Mar.	49,631	57,626	4,375	2,656	2,906	35,306	152,500
Apr.	48,338	60,436	6,260	5,988	3,016	30,962	155,000
May	55,893	67,362	6,477	8,334	600	33,864	172,500
June	58,206	68,457	4,972	2,809	600	29,956	165,000

Source: International Rubber Study Group. * Estimated.

World Consumption of Natural and Synthetic Rubber

(Including Latex)

(Long Tons)

Year	United States	United Kingdom	Canada	Europe*	Rest of World*	Total*
1946	1,039,296	126,770	39,196	145,000	115,804	1,467,500
1947	1,122,327	156,399	61,452	242,500	153,548	1,735,000
1948	1,069,404	196,286	62,121	392,000	182,379	1,902,500
1949	988,903	186,622	56,362	446,500	207,388	1,887,500
1950	1,258,557	222,425	68,695	448,500	287,055	2,285,000
1951	1,214,298	238,101	70,809	476,500	314,941	2,312,500
1952	1,261,413	202,179	67,099	550,000	254,901	2,335,000
1953	1,338,309	211,453	73,394	521,000	343,606	2,500,000
1954	1,233,012	247,612	71,656	544,250	408,094	2,505,000
1955	1,529,699	266,804	84,528	630,000	464,250	2,980,000
1956	1,436,482	232,345	91,458	775,500	489,215	3,025,000
1957	1,464,640	239,021	88,379	777,250	565,710	3,135,000
1958	1,364,404	238,439	83,904	905,000	638,353	3,230,000
1959:						
Mar.	147,080	21,967	8,535	64,750	52,668	295,000
Apr.	121,222	20,163	8,819	87,000	52,796	290,000
May	113,392	19,851	8,518	86,500	51,739	280,000
June	139,481	26,394	....	....	146,625	312,500

Source: International Rubber Study Group. * Estimated.

Rim Production

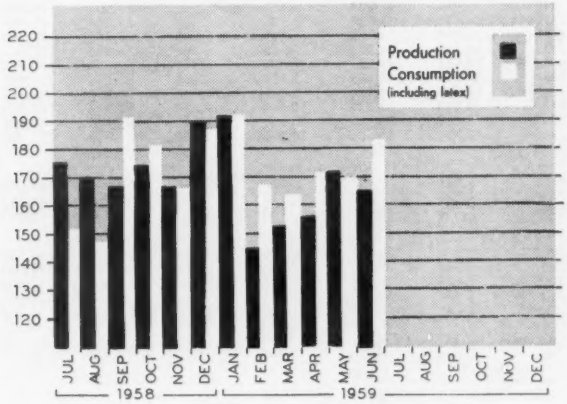
	1954	1955	1956	1957	1958
Passenger Car	25,952,322	38,092,080	27,109,610	27,301,567	20,665,688
Truck & Bus	4,463,689	6,642,329	6,315,428	5,468,223	3,887,910
Agricultural	1,279,040	1,931,768	1,416,938	1,368,127	1,218,240
Earth Mover	21,536	38,849	88,812	67,289	61,883
Total	31,734,587	46,705,036	34,930,788	34,205,206	25,833,721

	1959					
	Apr.	May	June	July	Aug.	Sept.
Passenger Car	2,603,391	2,498,117	2,660,094	1,816,678	1,413,466	1,760,810
Truck and Bus	604,155	501,362	512,843	449,744	356,554	328,918
Agricultural	192,303	153,822	188,060	74,252	106,041	98,625
Earth Mover	14,469	9,027	13,070	6,419	14,686	3,186
Total	3,414,318	3,162,328	3,374,067	2,347,093	1,890,747	2,191,539

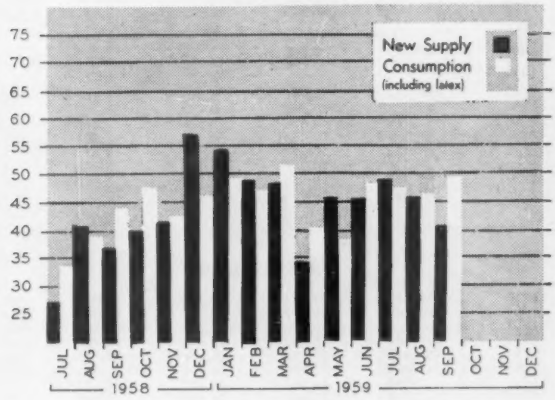
Source: The Tire & Rim Association, Inc.

STATISTICS at a glance

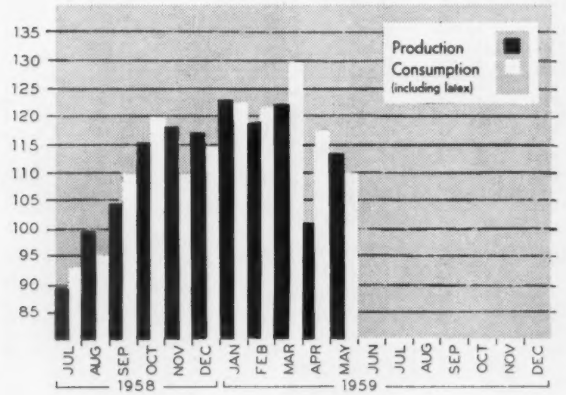
NATURAL RUBBER—WORLD
(thousands of long tons)



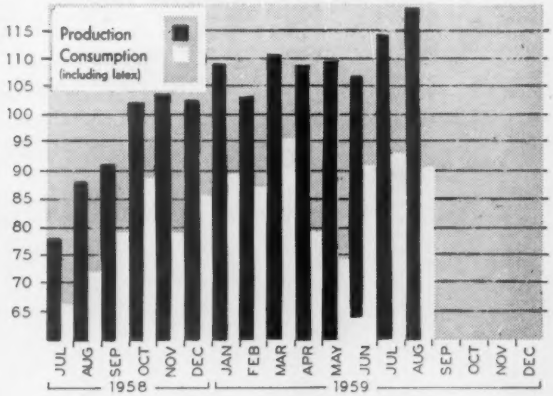
NATURAL RUBBER—UNITED STATES
(thousands of long tons)



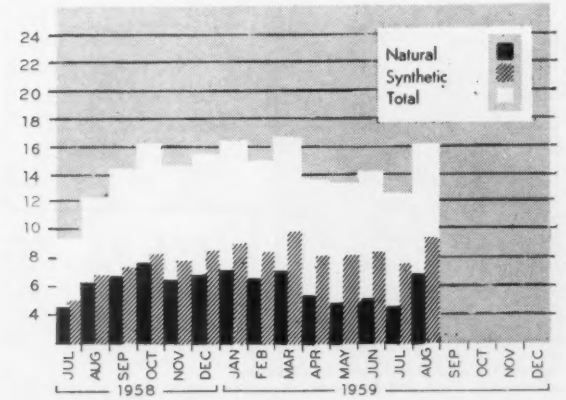
SYNTHETIC RUBBER—WORLD
(thousands of long tons)



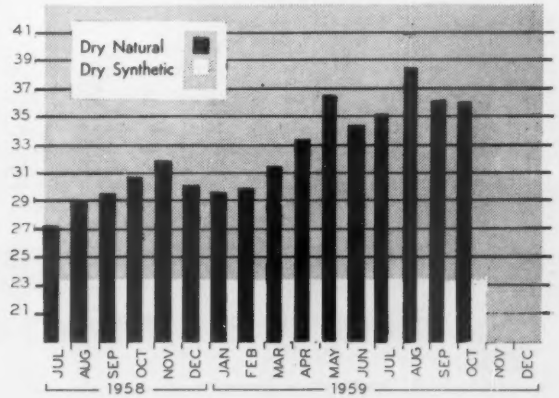
SYNTHETIC RUBBER—UNITED STATES
(thousands of long tons)



LATEX CONSUMPTION—UNITED STATES
(thousands of long tons)



PRICES—NATURAL AND SYNTHETIC
(cents per pound)



Synthetic Rubber in the United States

(All Quantities in Long Tons)

New Supply

Year	GR-S	Neoprene	Butyl	N-Type	Total
1949	310,539	35,215	54,046	11,072	410,932
1950	378,887	50,067	60,915	12,037	501,906
1951	704,529	58,907	76,475	15,333	855,244
1952	654,854	65,745	81,630	16,228	818,447
1953	680,728	80,495	79,801	20,198	861,222
1954	490,405	69,150	58,802	21,396	639,753
1955	801,145	91,357	56,179	32,623	982,304
1956	876,982	99,412	75,873	34,547	1,086,814
1957	913,321	110,721	67,418	33,618	1,125,078
1958	872,565	97,806	54,113	32,431	1,056,915
1958:					
Dec.	86,219	9,201	4,174	3,263	102,857
1959:					
Jan.	90,622	9,991	5,305	3,304	109,222
Feb.	83,662	10,256	5,898	3,407	103,223
Mar.	92,315	9,690	6,226	3,818	112,049
Apr.	88,509	10,455	6,301	3,324	108,589
May	89,625	10,249	6,470	3,617	109,961
June	87,226	10,216	5,590	3,707	106,739
July	95,207	9,365	6,420	3,843	114,835
Aug.	97,113	10,471	8,050	3,397	119,031

Consumption

1950	416,230	43,781	66,348	11,930	538,289
1951	626,444	48,887	70,500	13,066	758,897
1952	666,420	55,522	71,229	13,866	807,037
1953	624,181	65,900	77,826	16,929	784,836
1954	500,345	57,203	61,464	17,715	636,727
1955	741,997	72,876	53,991	26,035	894,899
1956	727,789	74,887	49,615	24,976	877,267
1957	767,218	75,461	55,413	25,187	923,279
1958:	730,196	69,694	53,432	26,590	880,912
1958:					
Dec.	71,731	6,955	4,897	2,606	86,189
1959.					
Jan.	74,222	7,198	5,359	2,857	89,636
Feb.	72,558	6,885	5,256	2,694	87,393
Mar.	78,792	7,444	5,687	3,166	95,089
Apr.	64,547	7,493	4,758	2,941	79,739
May	60,870	6,914	3,978	2,853	74,615
June	76,065	7,083	5,484	3,063	91,695
July	78,995	6,277	6,043	2,419	93,734
Aug.	75,340	7,117	5,533	3,047	91,037

Exports

1950	900	4,826	31	1,895	7,652
1951	483	6,825	216	1,725	9,249
1952	9,467	9,813	126	2,695	22,101
1953	7,692	11,494	237	3,245	22,668
1954	11,069	12,062	2,831	4,155	30,117
1955	60,704	18,098	9,895	4,593	93,290
1956	112,366	21,909	8,699	6,194	149,168
1957	157,977	30,242	8,748	6,377	203,344
1958	142,069	31,337	13,793	6,718	193,917
1958:					
Dec.	12,634	2,484	1,258	520	16,896
1959:					
Jan.	11,962	3,430	1,579	520	17,491
Feb.	11,615	2,404	1,169	648	15,836
Mar.	16,295	2,712	2,238	467	21,712
Apr.	19,154	3,741	2,135	527	25,557
May	12,281	2,942	2,587	642	18,452
June	21,871	2,522	2,386	937	27,716
July	19,814	4,105	1,580	440	25,939

Stocks

1949	77,731	4,654	12,224	3,433	98,042
1950	36,942	5,733	7,243	2,840	52,758
1951	105,271	8,379	12,481	3,821	129,912
1952	83,861	8,535	22,716	3,875	118,987
1953	135,153	11,480	24,866	4,346	175,845
1954	115,499	11,349	19,267	4,280	150,395
1955	108,989	12,220	10,500	6,030	137,739
1956	151,763	14,077	28,744	7,934	202,518
1957	140,199	18,843	31,489	7,454	197,985
1958	143,533	15,688	18,770	7,292	185,283
1959:					
Jan.	147,243	15,638	16,827	7,335	187,043
Feb.	148,606	15,990	16,339	7,468	188,403
Mar.	146,971	14,701	14,441	7,753	183,866
Apr.	147,867	14,848	12,496	7,728	182,939
May	156,209	15,024	12,710	7,820	191,763
June	145,486	14,986	11,128	7,969	179,569
July	142,606	15,187	9,899	8,912	176,604
Aug.	148,795	15,745	10,558	8,418	183,516

Source: U. S. Department of Commerce.

Natural and Synthetic Rubber Latex in the United States

(All Quantities in Long Tons)

New Supply

Year	Natural	GR-S	Neoprene	N-Type	Total Synthetic	Grand Total
1945	4,768	15,176	7,077	.....	22,253	27,021
1946	8,012	24,810	13,595	.....	38,405	46,417
1947	17,675	22,474	6,089	.....	28,563	46,238
1948	32,630	21,494	5,022	.....	26,516	59,146
1949	29,974	21,357	3,651	.....	25,008	54,982
1950	54,401	31,339	5,725	.....	37,064	91,465
1951	54,963	32,972	6,866	2,948	42,786	97,749
1952	48,228	42,273	7,598	4,164	54,035	102,263
1953	75,511	48,112	9,026	5,844	62,982	138,493
1954	74,483	48,379	8,214	6,866	63,459	137,942
1955	92,754	69,364	10,432	10,798	90,594	183,348
1956	72,013	69,720	10,642	10,650	91,012	163,025
1957	72,252	74,535	10,403	11,420	96,358	168,610
1958	67,591	65,669	10,679	11,560	87,908	155,499
1958:						
Oct.	6,994	7,617	1,170	1,308	10,095	17,089
Nov.	4,074	7,307	1,156	1,205	9,668	13,742
Dec.	7,950	6,891	986	1,033	8,910	16,860
1959:						
Jan.	8,574	7,801	1,049	1,104	9,954	18,528
Feb.	5,746	7,578	998	1,161	9,737	15,483
Mar.	7,039	8,587	1,013	1,269	10,869	17,908
Apr.	6,342	6,730	1,301	911	8,942	15,284
May	6,007	6,583	1,146	1,156	8,885	14,892
June	7,445	6,730	1,223	1,196	9,149	16,594
July	5,469	6,871	956	1,279	9,106	14,575
Aug.	6,992	8,225	1,242	1,258	10,725	17,717

Consumption[1]

1945	3,886	14,500	6,800	....	21,300	25,186
1946	5,714	23,500	13,000	....	36,500	42,214
1947	13,909	22,500	6,500	....	29,000	42,909
1948	28,489	21,500	5,250	....	26,750	55,239
1949	36,117	21,500	3,750	....	25,250	61,367
1950	56,138	31,000	5,500	....	36,500	92,638
1951	46,750	31,031	6,279	2,628	39,938	86,688
1952	53,567	40,562	7,368	3,093	51,023	104,590
1953	67,375	46,473	7,981	3,654	58,108	125,483
1954	75,931	44,173	7,251	4,507	55,931	131,862
1955	86,478	63,982	8,736	8,495	81,213	167,691
1956	74,082	62,762	8,708	8,021	79,491	153,573
1957	75,009	68,305	9,039	8,630	85,974	160,983
1958	70,183	60,283	9,555	10,549	80,387	150,570
1958:						
Oct.	7,643	6,534	1,039	1,094	8,667	16,310
Nov.	6,470	6,009	847	1,082	7,938	14,408
Dec.	6,748	6,893	854	1,081	8,828	15,576
1959:						
Jan.	7,184	6,886	925	1,244	9,055	16,239
Feb.	6,489	7,083	859	1,009	8,951	15,440
Mar.	7,052	7,275	1,054	1,208	9,537	16,589
Apr.	5,793	5,629	1,104	1,169	7,902	13,695
May	5,429	5,962	995	1,112	8,069	13,498
June	5,622	6,497	910	1,150	8,557	14,179
July	5,004	5,804	919	940	7,663	12,667
Aug.	6,613	7,348	961	1,116	9,425	16,038

Stocks at End of Period

1945	3,121	....	....	....	....	3,121
1946	4,865	....	....	....	....	4,865
1947	5,033	....	....	....	....	5,033
1948	11,235	....	....	....	....	11,235
1949	5,063	....	....	....	....	5,063
1950	4,927	....	....	....	....	4,927
1951	4,752	3,727	1,245	532	5,504	10,256
1952	6,201	5,040	1,019	902	6,961	13,162
1953	13,532	4,794	1,117	721	6,632	20,164
1954	11,133	5,134	1,087	811	7,032	18,165
1955	13,203	6,980	1,236	1,807	10,203	23,406
1956	12,064	7,451	1,384	1,358	10,393	22,457
1957	14,454	8,347	1,267	1,974	11,588	26,042
1958	8,900	7,672	1,663	2,519	11,854	20,754
1958:						
Oct.	10,324	7,129	1,365	2,229	10,376	20,700
Nov.	8,795	7,810	1,498	2,530	11,838	20,633
Dec.	8,900	7,672	1,663	2,519	11,854	20,754
1959:						
Jan.	10,025	7,822	1,551	2,418	11,791	21,816
Feb.	10,482	7,753	1,488	2,535	11,776	22,258
Mar.	9,375	8,209	1,441	2,670	12,320	21,695
Apr.	8,599	7,859	1,458	2,379	11,696	20,295
May	9,718	7,917	1,417	2,398	11,732	21,450
June	11,063	7,314	1,601	2,432	11,347	22,410
July	10,752	6,983	1,528	2,761	11,272	22,024
Aug.	11,472	6,775	1,576	2,779	11,130	22,602

Source: U. S. Department of Commerce.
Note: (1) GR-S and Neoprene consumption estimated through 1950.

DCI MAGNESIA PRODUCTS

can help you get HIGH QUALITY End Products

	ANALYSIS OF DCI MAGNESIAS					
	DCI Magnesium Oxide Light TECHNICAL	DCI Magnesium Oxide Medium TECHNICAL E-3	DCI Magnesium Oxide Heavy TECHNICAL	DCI Magnesium Oxide Heavy TECHNICAL	DCI Magnesium Carbonate TECHNICAL	DCI Magnesium Hydroxide N. F. & TECHNICAL
Product No.	1001	7001	4001-4002	8001	2001	3001
Bulk Density	Granular 5 lbs.	20 lbs	20-26 lbs	40 lbs	9 lbs	13 lbs
weight per cu. ft.	Powder 9 lbs					
Ignition loss	5.0%	6.0%	4.0%	4.0%	57.16%	
ANALYSIS: IGNITED BASIS						
SiO_2	0.04%	0.4%	0.7%	2.4%	0.11%	0.03%
Fe_2O_3	0.03%	0.2%	0.4%	0.07%	0.02%	0.02%
AL_2O_3	0.11%	0.1%	0.1%	0.04%	0.03%	0.06%
CaO	1.36%	1.3%	1.4%	0.49%	0.30%	0.94%
SCREEN TEST						
thru 200 mesh	100%	100%	93% or		100%	100%
thru 325 mesh	99.5%	99.5%	99.5%	99%	99.9%	99.9%

For free technical assistance and price information regarding D C I Magnesia Compounds, be sure to get in touch with . . . . . .

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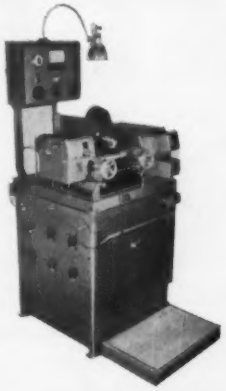

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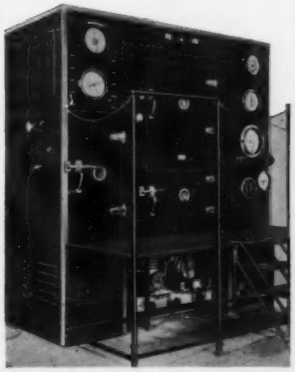

A. M. I. L.

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Paris 17, France
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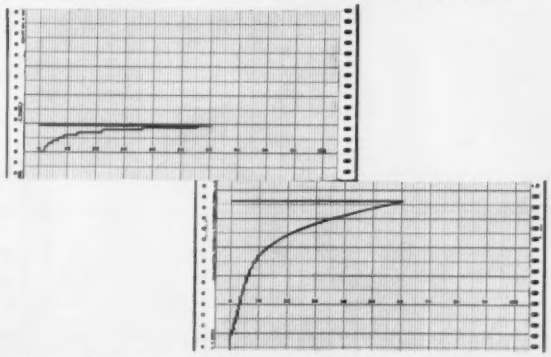
TEST TIPS

FROM THE SCOTT LABORATORY

RUBBER S-T-R-E-T-C-H TEST



Upper chart shows tensile test, plotted with "pipping" control, on dumbbell-shaped specimen to evaluate stretch and load at desired time interval. Lower chart shows standard tensile test curve for ring-shaped elastomeric specimen. Both tests were made with Scott's Model CRE tester—another good example of Scott testing versatility and convenience through *electronic* weighing.

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SCOTT TESTERS, INC.

85 Blackstone Street, Providence, Rhode Island

SCOTT TESTERS

THE SURE TEST . . . SCOTT!

Automotive Pneumatic Casings

(Thousands of Units)

	Shipments					
	Original Equipment	Replacement	Export	Total	Production	Inventory End of Period
1951 (total)	32,153	44,612	1,677	78,442	83,405	8,765
Passenger Car.	26,729	34,226	723	61,678	65,546	6,973
Truck and Bus	5,424	10,386	954	16,764	17,859	1,791
1952 (total)	29,484	54,342	1,520	85,346	90,411	14,110
Passenger Car.	24,106	45,458	741	70,305	74,341	11,251
Truck and Bus	5,378	8,884	779	15,041	16,070	2,859
1953 (total)	37,949	55,124	1,543	94,617	96,150	15,720
Passenger Car.	33,106	45,798	809	79,713	81,455	13,044
Truck and Bus	4,843	9,326	734	14,904	14,696	2,676
1954 (total)	33,333	55,155	1,753	90,241	89,141	14,762
Passenger Car.	29,741	47,044	928	77,713	76,794	12,217
Truck and Bus	3,591	8,111	826	12,528	12,347	2,545
1955 (total)	47,374	59,246	1,879	108,499	112,178	18,778
Passenger Car.	42,574	50,189	966	93,730	97,223	15,963
Truck and Bus	4,800	9,057	912	14,769	14,955	2,815
1956 (total)	35,422	62,146	1,757	99,325	100,406	79,872
Passenger Car.	30,873	53,252	875	85,000	85,546	16,494
Truck and Bus	4,548	8,894	883	14,325	14,859	3,378
1957 (total) ...	36,765	65,150	1,733	103,649	106,940	250,536
Passenger Car.	32,725	56,603	889	90,217	93,542	210,146
Truck and Bus	4,053	8,546	846	13,432	13,398	40,384
1958 (total)	26,783	70,797	1,348	98,928	96,563	20,939
Passenger Car.	23,408	61,570	717	85,696	83,636	17,778
Truck and Bus	3,375	9,226	631	13,232	12,927	3,161
1958:						
Sept. (total)	1,442	6,365	105	7,912	8,277	18,925
Passenger Car.	1,170	5,425	64	6,659	7,134	16,045
Truck and Bus	273	940	41	1,253	1,143	2,880
Oct. (total)	1,838	6,476	140	8,454	9,344	19,913
Passenger Car.	1,522	5,369	81	6,972	7,983	17,134
Truck and Bus	316	1,106	59	1,482	1,361	2,779
Nov. (total) ...	3,369	4,320	100	7,788	8,393	20,403
Passenger Car.	3,056	3,651	58	6,765	7,182	17,420
Truck and Bus	313	669	42	1,023	1,211	2,983
Dec. (total) ...	4,057	4,711	124	8,892	9,376	20,939
Passenger Car.	3,701	3,977	61	7,739	8,046	17,778
Truck and Bus	356	734	63	1,153	1,330	3,161
1959:						
Jan. (total)	2,960	6,742	104	9,806	10,184	21,399
Passenger Car.	2,631	6,028	57	8,716	8,859	17,998
Truck and Bus	329	714	47	1,090	1,325	3,401
Feb. (total)	2,805	5,611	135	8,551	10,270	23,019
Passenger Car.	2,442	4,932	60	7,434	8,962	19,435
Truck and Bus	364	679	74	1,117	1,308	3,584
Mar. (total)	3,336	7,103	117	10,557	11,350	23,862
Passenger Car.	2,930	6,261	62	9,253	9,959	20,181
Truck and Bus	406	842	56	1,304	1,391	3,680
Apr. (total)	3,594	7,297	109	10,999	8,025	20,872
Passenger Car.	3,115	6,390	65	9,569	6,986	17,597
Truck and Bus	479	907	44	1,430	1,039	3,276
May (total)	3,291	6,356	79	9,726	7,796	18,727
Passenger Car.	2,848	5,617	38	8,504	6,853	15,721
Truck and Bus	442	738	41	1,222	843	3,006
June (total)	3,392	6,756	90	10,237	10,294	19,088
Passenger Car.	2,903	5,936	46	8,886	9,022	16,134
Truck and Bus	488	820	44	1,352	1,272	2,954
July (total)	3,588	6,832	112	10,532	11,223	19,877
Passenger Car.	3,188	5,988	65	9,242	9,857	16,853
Truck and Bus	340	844	47	1,290	1,366	3,023
Aug. (total)	1,249	6,595	114	7,957	9,683	21,730
Passenger Car.	973	5,721	67	6,761	8,458	18,677
Truck and Bus	276	874	46	1,196	1,225	3,054

Source: The Rubber Manufacturers Association, Inc.

Automobile Production in U. S.

(Civilian Production Only)

Year	Passenger Cars	Trucks	Total	Year	Passenger Cars	Trucks	Total
1939	2,866,796	704,308	3,571,104	1949	5,108,841	1,123,736	6,232,577
1940	3,692,328	721,637	4,413,965	1950	6,665,836	1,332,263	7,998,099
1941	3,744,500	875,381	4,619,681	1951	5,337,729	1,420,432	6,758,161
1942	220,814	133,083	353,897	1952	4,320,794	1,212,790	5,533,584
1943	0	4,501	4,501	1953	6,121,787	1,202,196	7,323,983
1944	0	124,819	124,819	1954	5,558,897	1,038,045	6,596,942
1945	83,792	313,643	397,435	1955	7,920,186	1,245,018	9,165,204
1946	2,148,699	930,760	3,079,429	1956	5,816,109	1,100,417	6,916,526
1947	3,558,178	1,220,634	4,778,812	1957	6,113,344	1,097,006	7,210,350
1948	3,909,270	1,363,856	5,132,090	1958	4,257,812	874,278	5,132,090
1958:							
Jan.	478,416	79,790	558,206	July	316,408	65,047	381,455
Feb.	396,221	71,024	467,245	Aug.	194,974	55,221	250,195
Mar.	359,464	73,658	433,122	Sept.	102,687	46,353	149,040
Apr.	322,482	73,886	396,368	Oct.	272,241	69,934	342,175
May	352,076	75,291	427,367	Nov.	511,885	93,282	605,167
June	342,228	70,652	412,880	Dec.	608,730	100,140	708,870
1959:							
Jan.	539,451	96,044	635,495	July	548,524	114,687	663,211
Feb.	476,977	99,973	576,950	Aug.	255,831	60,070	315,901
Mar.	575,012	111,355	686,367	Sept.	.....	.....	.....
Apr.	585,789	116,910	702,699	Oct.	.....	.....	.....
May	545,001	114,995	659,996	Nov.	.....	.....	.....
June	554,878	119,544	674,422	Dec.	.....	.....	.....

Source: Automobile Manufacturers Association.

Note: Figures are based on factory sales. Revisions are made from time to time in these figures and the latest issue should be consulted for accuracy.

Automotive Inner Tubes

(Thousands of Units)

Year	Shipments: Original Equipment	Shipments: Replacement	Shipments: Export	Shipments: Total	Production	Inventory End of Period
1946	15,327	59,357	1,424	76,108	77,251	3,820
1947	25,046	46,560	2,483	74,088	79,181	8,059
1948	26,833	40,548	1,119	68,499	70,033	9,641
1949	31,521	31,450	887	63,858	65,114	10,657
1950	41,240	42,671	811	84,723	80,179	...
1951	32,151	32,284	1,071	65,507	67,249	10,094
1952	29,451	32,985	1,014	63,449	65,073	12,036
1953	37,957	36,072	878	74,907	74,425	11,874
1954	25,071	35,576	945	61,593	48,279	9,519
1955	5,001	33,387	1,001	39,389	35,900	6,833
1956	3,100	32,358	1,040	36,498	34,405	6,109
1957	3,046	35,687	1,076	39,806	39,774	80,077
1958	2,678	37,872	870	41,420	41,266	8,602
1958:						
Dec.	288	3,029	94	3,411	3,491	8,602
1959:						
Jan.	287	4,450	63	4,800	3,806	7,536
Feb.	311	3,924	81	4,316	4,094	7,364
Mar.	339	4,013	83	4,435	4,459	7,629
Apr.	389	3,474	66	3,928	3,380	7,219
May	363	2,853	59	3,275	2,752	6,849
June	392	3,421	59	3,872	3,683	7,000
July	317	3,564	66	3,948	4,345	7,560
Aug.	210	3,306	77	3,592	3,716	7,848

Source: The Rubber Manufacturers Association, Inc.

Vinyl and Vinyl Copolymer Resins—Sales

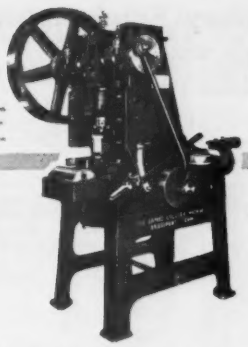
(Thousands of Pounds—Resin Content)

	Polyvinyl Chloride and Copolymer Resins: Film	Sheeting	Molding & Extrusion	Textile & Paper Treating	Flooring	Protective Coatings	All Other Uses	All Other Vinyl Resins: Adhesives	All Other Uses	Grand Total
1953	63,691	62,385	129,215	52,353	22,152	22,823	27,790	22,411	77,478	480,299
1954	69,943	56,588	147,284	49,546	34,890	23,676	35,148	26,609	74,090	517,773
1955	83,276	51,424	183,736	64,223	56,357	27,439	53,868	31,853	105,644	657,821
1956	78,063	55,598	206,726	62,931	65,384	28,522	71,859	36,565	115,151	720,799
1957	90,543	56,344	216,517	66,392	81,357	31,519	50,637	41,665	113,396	748,370
1958	72,404	67,594	214,701	63,050	113,583	28,913	68,307	52,904	117,752	801,208
1958:										
Nov.	5,760	6,431	20,239	6,024	9,938	2,134	7,227	4,015	10,439	72,207
Dec.	5,954	7,871	22,162	6,110	9,843	1,996	9,376	3,815	11,292	78,419
1959:										
Jan.	5,959	8,050	23,818	5,139	11,708	2,442	5,988	3,533	12,648	79,285
Feb.	5,590	9,094	22,638	5,052	11,176	2,325	7,312	4,139	12,601	79,927
Mar.	7,088	8,735	25,086	5,514	13,568	2,537	8,014	4,919	14,257	89,718
Apr.	7,526	10,390	27,226	5,951	14,096	3,038	8,376	5,182	15,282	97,067
May	6,765	10,664	25,561	6,466	13,762	2,583	7,614	4,662	13,972	92,049
June	7,517	11,227	24,711	6,231	12,073	2,625	8,447	5,022	14,783	92,636
July	6,545	9,329	22,645	5,263	12,156	2,850	7,340	4,853	13,284	84,265
Aug.	7,074	10,750	25,069	5,683	12,867	2,602	7,940	4,915	12,379	89,279

Source: Chemical Division, U. S. Tariff Commission.

COULTER Cutting Machines set the standard!

Finest in Rubber Cutting Machines Since 1896



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Precision cutting for both high speed production or short runs.

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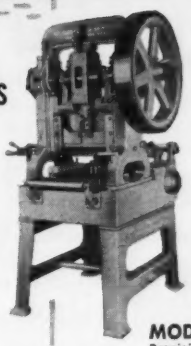
- Peak production loads
- Short runs
- Multiple heels and taps
- Half and full soles
- Mechanical rubber goods



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First, you enjoy greater production with cutting speeds at rates up to 15,000 pieces per hour.

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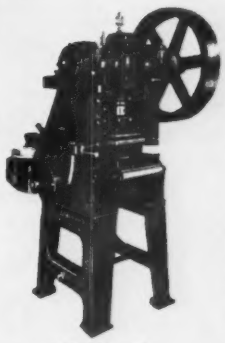

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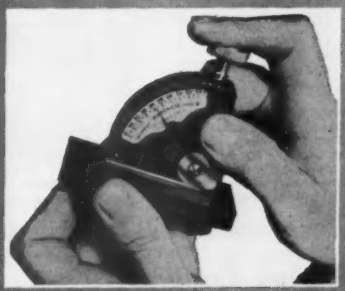

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Rubber Industry Employment Earnings and Hours

All Rubber Products

Mo.	1958 Production Workers (thousands)	1958 Average Weekly Earnings	1958 Average Weekly Hours	1958 Average Hourly Earnings	1959 Production Workers (thousands)	1959 Average Weekly Earnings	1959 Average Weekly Hours	1959 Average Hourly Earnings
Jan.	200.9	$87.48	38.2	$2.29	199.1	$100.28	41.1	$2.44
Feb.	191.3	85.04	37.3	2.28	198.8	101.09	41.6	2.43
Mar.	184.0	87.02	38.0	2.29	201.5	103.74	42.0	2.47
Apr.	176.0	85.88	37.5	2.29	176.0	101.57	41.8	2.43
May	172.3	87.86	38.2	2.30	171.8	101.46	42.1	2.41
June	175.8	91.10	39.1	2.33	198.6	93.56	38.5	2.43
July	175.1	91.89	39.1	2.35	200.9	.....	...	...
Aug.	181.2	96.80	40.5	2.39	....	.....	...	...
Sept.	187.5	97.51	40.8	2.39	....	.....	...	...
Oct.	194.5	97.27	40.7	2.39	....	.....	...	...
Nov.	195.3	98.09	40.7	2.41	....	.....	...	...
Dec.	198.2	102.66	41.9	2.45	....	.....	...	...
Tires and Tubes								
Jan.	81.6	98.52	36.9	2.67	76.9	117.55	41.1	2.86
Feb.	78.5	93.02	36.1	2.65	76.2	118.98	41.6	2.86
Mar.	76.0	98.05	37.0	2.65	77.9	122.96	42.4	2.90
Apr.	72.1	95.67	36.1	2.65	66.0	123.98	42.9	2.89
May	70.4	99.48	37.4	2.66	52.2	126.13	42.9	2.94
June	71.2	103.63	38.1	2.72	73.0	99.96	34.0	2.94
July	71.0	106.59	38.9	2.74	....	.....	...	...
Aug.	72.5	113.96	40.7	2.80	....	.....	...	...
Sept.	74.1	113.40	40.5	2.80	....	.....	...	...
Oct.	75.3	113.24	40.3	2.81	....	.....	...	...
Nov.	76.2	115.75	40.9	2.83	....	.....	...	...
Dec.	77.1	121.40	42.2	2.87	....	.....	...	...
Rubber Footwear								
Jan.	17.5	74.87	39.2	1.91	17.1	78.20	39.9	1.96
Feb.	17.0	74.68	39.1	1.91	17.1	80.59	40.7	1.98
Mar.	16.7	76.61	39.9	1.92	17.4	79.79	40.3	1.98
Apr.	16.5	75.46	39.3	1.92	12.9	73.05	39.7	1.84
May	16.3	75.85	39.3	1.93	17.7	79.58	40.6	1.96
June	16.3	11.20	40.0	1.93	18.3	80.38	40.8	1.97
July	15.9	75.25	39.4	1.91	....	.....	...	...
Aug.	16.4	77.18	40.2	1.92	....	.....	...	...
Sept.	16.8	76.62	39.7	1.93	....	.....	...	...
Oct.	17.1	77.01	39.9	1.93	....	.....	...	...
Nov.	17.2	77.22	39.6	1.95	....	.....	...	...
Dec.	17.1	78.01	39.8	1.96	....	.....	...	...
All Other Rubber Products								
Jan.	101.8	80.94	39.1	2.07	105.1	91.27	41.3	2.21
Feb.	95.8	80.32	38.8	2.07	105.5	91.96	41.8	2.20
Mar.	91.3	79.87	38.4	2.08	106.2	93.02	41.9	2.22
Apr.	87.4	79.87	38.4	2.08	97.1	90.03	41.3	2.18
May	85.6	80.29	38.6	2.08	101.9	92.18	41.9	2.20
June	88.3	83.77	39.7	2.11	107.3	91.46	41.2	2.22
July	88.2	82.92	39.3	2.11	....	.....	...	...
Aug.	92.3	86.24	40.3	2.14	....	.....	...	...
Sept.	96.6	89.21	41.3	2.16	....	.....	...	...
Oct.	102.1	88.78	41.1	2.16	....	.....	...	...
Nov.	101.9	88.54	40.8	2.17	....	.....	...	...
Dec.	104.0	92.60	41.9	2.21	....	.....	...	...

Source: U. S. Department of Labor.

Note: Data are based upon reports from cooperating establishments covering both full and part-time employees who work during, or received pay for, any part of the pay period ending nearest the 15th of the month. These employment series have been adjusted to first quarter 1954 benchmark levels indicated by data from government social insurance programs. Hours and earnings data pertain only to production and related workers.

Spot Closing Cotton Prices

(Middling Upland Grade—New York Market—in Cents)

Average Monthly Price Per Pound

	1952	1953	1954	1955	1956	1957	1958	1959
Jan.	42.96	33.24	34.16	35.07	35.24	34.82	36.31	35.67
Feb.	41.64	33.76	35.00	35.04	36.26	34.82	35.83	35.69
Mar.	41.70	34.10	35.23	34.33	36.70	35.35	36.05	35.71
Apr.	41.79	33.85	35.22	34.23	36.43	35.43	36.00	36.05
May	39.98	34.30	35.34	34.80	36.65	35.40	36.27	36.24
June	41.31	34.11	35.17	34.83	36.67	35.45	36.33	36.05
July	40.37	34.20	35.37	34.61	35.43	35.49	36.51	34.67
Aug.	40.42	33.82	35.19	34.53	34.31	35.15	36.36	33.17
Sept.	39.75	33.69	35.46	33.85	34.35	34.74	36.00	32.99
Oct.	37.52	33.53	35.24	33.93	34.45	35.09	36.23	32.77
Nov.	35.59	33.60	34.80	34.87	34.56	36.06	36.24	....
Dec.	33.76	33.52	35.03	34.95	34.56	36.50	35.75	....
Average for Year	39.71	33.81	35.10	34.59	35.50	35.36	36.16	....

Note: The Government established a ceiling of 45.76c for spot cotton on March 3, 1951. (a) Trading suspended during February.

Production Index for the Rubber Industry

(1947-1949 = 100)

(Based on man-hours)

	1957	1958	1959		1957	1958	1959
Jan.	145	116	142	July	136	125	172
Feb.	141	114	150	Aug.	141	131	162
Mar.	145	116	156	Sept.	138	136	...
Apr.	132	112	135	Oct.	135	133	...
May	134	113	134	Nov.	131	141	...
June	135	125	155	Dec.	117	140	...

Sales by the Rubber Industry

(in Millions of Dollars*)

	1957	1958	1959		1957	1958	1959
Jan.	496	448	508	July	514	478	519
Feb.	495	413	490	Aug.	514	438	505
Mar.	476	396	506	Sept.	481	464	...
Apr.	490	429	543	Oct.	490	493	...
May	481	428	524	Nov.	431	472	...
June	458	445	520	Dec.	427	518	...

Rubber Manufacturers' Inventories

(in Millions of Dollars*)

	1957	1958	1959		1957	1958	1959
Jan.	1,047	1,100	998	July	1,045	980	1,075
Feb.	1,036	1,087	1,022	Aug.	1,074	1,024	1,077
Mar.	1,030	1,069	1,030	Sept.	1,074	1,024	...
Apr.	1,031	1,047	1,015	Oct.	1,097	1,022	...
May	1,024	1,020	995	Nov.	1,101	1,018	...
June	1,027	986	1,013	Dec.	1,092	994	...

Source: U. S. Department of Commerce.
Notes: * Adjusted for seasonal variation.

No. 1 R.S.S.—Annual Average Prices

(New York Market—Cents per Pound)

Year	High	Low	Avg.	Year	High	Low	Avg.
1917	90	52	72.23	1938	17⅞	10⅛	14.64
1918	70	40	60.15	1939	24	14⅛	17.57
1919	57	38½	48.70	1940	24	18¾	20.10
1920	56½	16	36.30	1941	24⅞	19⅛	22.40
1921	21¼	11½	16.36	1942	22½	22½	22.50
1922	28⅜	13¾	17.50	1943	22½	22½	22.50
1923	37⅛	24¾	29.45	1944	22½	22½	22.50
1924	40⅛	17⅝	26.20	1945	22½	22½	22.50
1925	121	34⅜	72.46	1946	23½	22½	22.50
1926	88½	36¾	48.50	1947	25	14	20.00
1927	41¾	33	37.72	1948	25	18	21.99
1928	41¼	17	22.48	1949	19¾	15⅞	17.57
1929	26⅞	15½	20.55	1950	86	18	41.10
1930	16½	7½	11.98	1951	76	52	(a)
1931	8⅝	4¼	6.17	1952*	33	26½	29.15
1932	4¾	2½	3.49	1953	31⅜	19⅞	24.21
1933	9⅞	2⅝	5.96	1954	34½	19½	23.61
1934	15⅞	8¾	12.92	1955	52	29⅛	39.16
1935	13¾	10½	12.37	1956	45	26½	34.24
1936	23	13½	16.41	1957	37⅜	26⅜	31.13
1937	26⅞	14	19.39	1958	32⅝	24⅝	28.13

Note: Price was fixed by Government on August 6, 1941, at 22½c a pound for non-war uses. Free trading was resumed May 1, 1947. (a) Free trading suspended March 31, 1951. GSA selling price ranged between 52 and 66c during balance of year. * Free trading was resumed on July 1, 1952; figures represent only July through December, 1952.

No. 1 R.S.S.—Monthly Average Prices

(New York Market—Cents per pound)

	1952	1953	1954	1955	1956	1957	1958	1959
Jan.	....	29.40	20.22	33.92	41.70	33.32	27.15	30.34
Feb.	....	27.57	19.98	34.90	33.68	30.43	26.32	30.26
Mar.	....	26.59	20.16	31.08	33.68	31.76	26.65	31.62
Apr.	....	24.66	22.06	31.75	31.74	32.23	26.44	33.72
May	....	25.52	21.96	31.35	29.61	32.12	25.51	36.48
June	....	24.42	23.01	34.74	30.54	32.80	26.20	34.31
July	30.52	23.64	24.12	40.84	33.91	32.88	27.70	35.19
Aug.	29.36	23.36	23.26	45.85	35.69	32.13	28.72	38.43
Sept.	27.42	23.06	23.00	48.27	32.64	29.94	29.49	40.22
Oct.	27.26	20.82	26.57	43.81	32.68	29.24	31.06	41.50
Nov.	29.25	20.58	28.07	44.95	35.18	27.47	32.10	....
Dec.	31.26	20.92	29.88	48.40	37.01	29.25	30.28	....
Average for Year	29.15	24.21	23.61	39.16	34.24	31.13	28.13	....

Note: (*) Free trading suspended March 31, 1951, and resumed on July 1, 1952.

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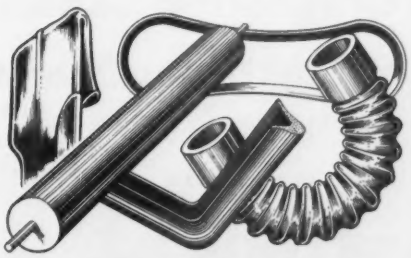

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Various Compounding Materials Consumed by the Rubber Industry

Material	1951	1952	1953	1954	1955	1956	1957
Antimony, Primary							
Short tons	19c	66c	20c	49c	78	156	284
% of total	.001	.004	.001	.004	.006	.010	.024
Asphalt: [a]							
Short tons	21,414	33,288	.....	.....	.. ..	.....	.....
% of total	0.3	0.4	.....	.....	.....	.....	.....
Barite (Barytes):							
Short tons	15,000	18,000	21,000	20,000	25,104	22,101	21,782
% of total	2.13	2.0	2.0	2.0	2.0	2.0	1.0
Carbon Black:							
Short tons	530,614	537,273	566,797	511,813	643,430	622,325	635,781
% of total	93.9	93.1	94.4	93.5	93.5	95.5	95.5
Clay, Kaolin:							
Short tons	231,331	240,982	241,052	247,431	257,223	268,157	301,185
% of total	12.7	13.2	12.8	13.2	11.9	12.0	14.0
Clay, Fire & Stoneware:							
Short tons	.....	9,322	18,475	8,781	2,928	....	.....
% of total	.....	0.1	.2	.1	.2	.....	.....
Lime:							
Short tons	1,126	2,000	1,631	1,555	1,465	2,487	2,799
% of total	(d)	(d)	(d)	(d)	(d)	(d)	(d)
Litharge:							
Short tons	2,641	2,109	2,230	1,768	1,947	2,266	1,898
% of total	1.1	1.5	1.4	1.3	1.3	1.7	1.7
Lithopone:							
Short tons	3,295	1,523	1,723	1,701	2,163	2,000[e]	....
% of total	3.2	2.5	3.3	3.9	5.0	5.0	....
Mica, Ground:							
Short tons	6,551	5,126	5,668	5,021	7,339	7,021	8,579
% of total	9.0	7.0	7.8	6.3	6.9	8.0	9.0
Sulfur:							
Short tons	84,000	84,000	89,600	84,000	89,600	89,600	89,600[e]
% of total	1.4	1.4	1.4	1.3	1.2	1.1	1.1
Talc: [b]							
Short tons	70,970	64,476	61,408	58,139	38,309	30,253	28,532
% of total	11.2	10.9	10.0	9.7	5.4	5.0	6.0
Zinc Oxide:							
Short tons	71,507	72,774	78,439	71,058	86,677	80,459	81,745
% of total	48.4	51.2	52.7	50.7	51.5	51.9	54.0

Source: U. S. Bureau of Mines.

Notes: (a) Solid and semi-solid products of less than 200 penetration. (b) Includes prophyllite and ground soapstone. (c) Does not include precipitated antimony sulfide as in previous years. (d) Negligible. (e) Estimated.

Reclaimed Rubber

(Including Natural and Synthetic)

(All Quantities in Long Tons)

Year	New Supply	Consumption: Tons	Consumption: % to Crude [a]	Exports	Stocks On Hand at End of Period
1941	274,202	251,231	32.2	13,851	41,750
1942	286,00/ [b]	254,820	64.6	30,405	42,532
1943	304,058 [c]	291,082	59.6	15,678	46,201
1944	260,631 [d]	251,083	35.3	11,800	43,832
1945	243,309	241,036	30.2	13,413	28,155
1946	295,612	275,410	26.5	14,461	33,666
1947	291,395	288,395	24.8	14,556	35,943
1948	266,861	261,113	24.4	11,428	32,630
1949	224,029	226,679	22.5	10,637	28,263
1950	314,008	303,733	24.1	11,740	35,708
1951	366,700	346,121	25.6	14,722	45,082
1952	274,981	280,002	22.2	11,180	30,664
1953	298,336	285,050	21.3	11,597	32,319
1954	258,101	249,049	20.2	10,232	30,746
1955	326,649	312,781	20.4	13,988	31,498
1956	287,220	270,547	18.8	13,832	34,969
1957	271,647	267,352	18.2	13,021	29,323
1958	259,809	248,156	18.2	11,362	29,063
1958:					
June	21,230	20,652	19.2	1,024	27,763
July	18,136	18,350	18.2	1,087	26,442
Aug.	22,432	19,347	17.4	900	27,961
Sept.	22,641	21,771	17.7	1,005	26,676
Oct.	26,554	23,563	17.2	1,028	27,340
Nov.	22,450	21,271	17.4	1,051	27,680
Dec.	24,830	23,285	17.5	841	29,063
1959:					
Jan.	25,790	25,002	17.9	1,157	27,157
Feb.	25,290	24,471	18.2	1,041	27,504
Mar.	29,327	27,869	18.8	1,375	27,582
Apr.	21,672	22,380	18.5	1,225	25,131
May	19,441	20,496	18.1	980	23,554
June	26,169	24,998	17.9	1,054	23,448
July	27,884	23,942	16.9	1,236	25,949

Source: U. S. Bureau of Mines.

Notes: (a) Solid and semi-solid products of less than 200 penetration. (b) Includes prophyllite and ground soapstone. (c) Does not include precipitated antimony sulfide as in previous years. (d) Negligible. (e) Estimated.

Cotton, Rayon and Nylon Tire Fabrics

(In Thousands of Pounds)

	Production: Rayon Tire Cord Net Woven	Production: Rayon Tire Cord Woven	Production: Cotton and Nylon Cord & Fabric [a]	Production: Chafer Fabrics (all fibers)	Production: Total Tire Cord and Fabric	Stocks [b]: Cotton and Nylon Cord & Fabric	Stocks [b]: Rayon Cord and Fabric
1958:							
Jan.-Mar.	8,372	56,522	25,647	7,367	92,924	11,255	33,913
Apr.-June	.....	.....	30,745	6,020	80,533	11,274	26,327
July-Sept.	.....	.....	31,371	6,467	91,984	11,229	26,428
Oct.-Dec.	.....	.....	34,858	8,466	107,532	12,251	25,936
Total	8,372	56,522	122,621	28,320	372,973	46,009	112,604
1959:							
Jan.-Mar.	77,307	77,307	41,565	9,163	122,661	14,025	22,093
Apr.-June	76,265	76,265	37,102	7,699	116,965	16,811	31,094
July-Sept.	.....	.....	.....	.....	.....	.....	.....
Oct.-Dec.	.....	.....	.....	.....	.....	.....	.....
Total	.....	.....	.....	.....	.....	.....	.....

Source: Bureau of the Census, U. S. Department of Commerce.

Notes: (a) Combined to avoid disclosing figures for individual companies. (b) At end of period.

Gasoline Consumption

(In Thousands of Barrels of 42 Gallons)

	1953	1954	1955	1956	1957	1958	1959
Jan.	89,634	89,634	96,397	100,642	109,295	107,281	114,720
Feb.	86,458	86,206	88,464	98,088	96,694	95,516	99,759
Mar.	98,158	101,549	105,684	112,412	113,166	108,914	118,995
Apr.	102,044	103,866	111,116	113,034	115,820	118,477	124,917
May	105,918	104,418	115,707	123,560	124,325	125,137	127,049
June	114,703	113,037	120,710	126,833	121,598	125,444	133,695
July	112,969	112,231	115,653	120,708	130,251	130,903	137,141
Aug.	109,124	110,223	121,816	125,847	128,808	129,925	.....
Sept.	106,158	104,706	113,379	111,574	113,567	120,389	.....
Oct.	106,037	105,607	112,558	119,204	119,334	125,097	.....
Nov.	99,210	102,393	109,212	112,113	107,705	110,587	.....
Dec.	100,225	104,258	111,034	108,096	112,691	120,305	.....
Total	1,230,629	1,238,346	1,321,730	1,372,116	1,393,254	1,417,975	

Source: U. S. Bureau of Mines.

U. S. Gross Imports of Balata, Jelutong, Gutta-Percha, etc.

(All Quantities in Long Tons)

Year	Balata: Tons	Balata: Value	Jelutong: Tons	Jelutong: Value	Gutta-Percha & Other Guttas: Tons	Gutta-Percha & Other Guttas: Value
1945	1,361	907,253	....	.....	36	21,970
1946	2,281	2,233,065	304	256,169	423	458,064
1947	1,982	2,276,531	2,878	1,496,887	392	779,591
1948	1,195	805,078	3,401	2,377,765	423	542,788
1949	1,391	814,554	1,043	834,978	197	189,021
1950	2,117	1,589,885	1,789	1,515,162	541	745,418
1951	2,452	1,973,271	1,669	2,608,359	383	430,539
1952	988	762,994	1,636	2,094,983	282	385,890
1953	1,619	866,248	1,027	1,166,837	235	303,116
1954	949	504,065	2,196	2,624,926	417	511,055
1955	1,022	967,369	1,679	1,731,621	284	318,115
1956	1,396	1,111,165	1,851	1,909,447	290	309,615
1957	1,037	670,821	1,680	1,942,067	230	270,487
1958	745	536,820	1,501	1,698,840	157	224,499
1959:						
Jan.	132	132,210	175	205,421	12	16,860
Feb.	49	41,650	104	121,702	7	8,439
Mar.	97	86,358	160	223,653	27	31,735
Apr.	91	59,313	108	135,129	10	16,920
May	90	65,771	115	144,934	51	53,364
June	69	28,122	68	85,116	37	42,085
July	82	76,165	113	107,289	28	34,629

Source: U. S. Department of Commerce.

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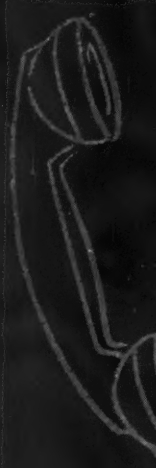

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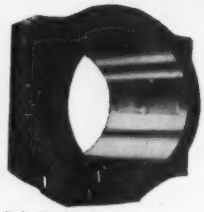
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